ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED SECTION OF THE U. S.

APPLIANCES • PAGE 64

McGraw-Hill Co. of California

JANUARY 1947

25c a Copy

READY FOR Southern California's FUTURE

"MORE POWER" has been the constant demand of rapidly growing Southern and Central California ever since Edison electricity was first available. Always the power has been ready and waiting.

Today, as thousands of new homes, new businesses, and new factories are established, Edison keeps pace. In 1946, the third transmission line from Boulder Dam was completed; a new steam-electric generating station is under construction at Redondo Beach; and another unit is being added to the Edison hydro plants of the Big Creek project on the San Joaquin River.

The electrical industry can sell new appliances and added electrical service with full assurance that Edison power will be on the job. Edison is ready for the greatest era of expansion this area has yet experienced.

SOUTHERN CALIFORNIA EDISON COMPANY

Edison

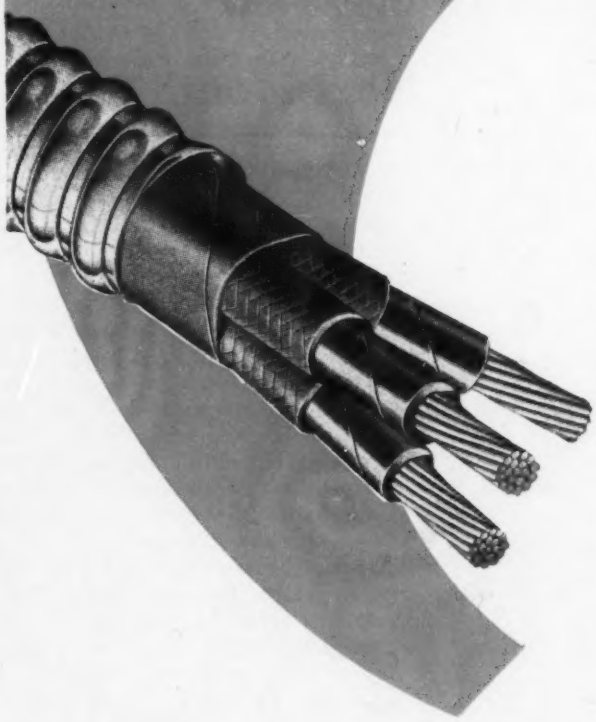
ELECTRICAL WEST (with which is consolidated The Journal of Electricity), January, 1947. Vol 98, No. 1. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco 4, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rates—U. S., U. S. Possessions and Latin American Republics: $2, 1 year; $3, 2 years; $4, 3 years. Canada: $2.50, 1 year; $4, 2 years; $5, 3 years. Other countries: $3, 1 year; $5, 2 years; $6, 3 years. Single copy, 25c. Copyright, 1947. McGraw-Hill Company of California. All rights reserved.

"WE SAVED ⅔ OF INSTALLATION COST with G-E INTERLOCKED-ARMOR CABLE,"

says Paul Williamson, Chief Engr., Woolrich Woolen Mills.

Above, two 500-MCM interlocked-armor cables in plant of Woolrich Woolen Mills. These flexible cables make a 90-degree turn at the wall, require only simple supports.

Below, No. 1799 Varnished-cambric interlocked-armor cable (600 volts).



HERE'S what Mr. Williamson says about General Electric No. 1799 Varnished-cambric Interlocked-armor Cable:

"I'd say it takes about a third as many man-hours of work to install G-E interlocked as it does to put in a conduit job. That's because material-handling time is a lot lower, and because interlocked is lighter weight, takes less space, and is flexible and easier to handle.

"I've put in a lot of conduit in my time, and I hope I've installed the last of it. Interlocked has it beat on every count—economies in time, material, and re-use in changed circuits.

"Last summer our crew put in a complete installation of 512 feet in three and one-half hours! What's more, it's a good-looking, neat job, and there to stay."

General Electric interlocked-armor cable is used for power-distribution systems at 110 to 15,000 volts in power stations and industrial plants. We believe it gives you the most in ease of handling and in long service life.

You can install it in less time with less materials in less space. For a detailed description of this fine cable and the many means by which its installation can be adapted to existing plant conditions, call your local G-E office or write for Bulletin GEA-4507. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

601-34-1200

ELECTRICAL WEST

VOL. 98 JANUARY 1947 NO. 1

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COVER PHOTO: Patrolmen's shelter cabin on Argentine Pass, where Public Service Co. of Colorado's 155-mi. Shoshone-Denver line crosses the continental divide at 13,525-ft. elevation. During the winter, company crews reach this and other isolated sections of the line on skiis, snowshoes and in army-developed snow motors.

CHANGE OF ADDRESS

Circulation Manager,
Electrical West,
68 Post St.
San Francisco, Calif.

Please change my address

From .....

To .....

Signed .....

People

Ben L. Wells
heads a sales and leadership training organization in Los Angeles which has been engaged by a number of companies to train foremen and supervisors as well as executives in the real art of good leadership. A second article will follow the one on p. 39.

J. H. Vivian
whose PCEA data on generator overvoltage tests appears on p. 42, is familiar to ELECTRICAL WEST readers who will remember his articles written when he was protection engineer for Southern California Edison Co. Still with that utility, his present title is maintenance engineer. From that position he continues to maintain a steady fire of technical contributions.

Fred Benz
made this column in April 1945, when he authored an article on synthetic rubber. Working out of San Francisco, he heads up U. S. Rubber's field activities in the West in connection with wire and cable. This time he tells about aluminum conductors for interior use.—p. 47.

Next Month

the 28th annual review and forecast issue will summarize the 1946 accomplishment of electrical enterprise in the eleven Western States and set forth the plans for 1947.

With generation at an all-time high, with construction proceeding at top speed to keep ahead of demand, with sales programs being made ready to handle an unprecedented output of consuming devices, with the building industry geared up for new records of construction——with such a picture taking shape this year's analysis will be studied with especial interest.

Among the features: tables of energy generation by states, installed capacity, numbers of customers, merchandising markets and campaigns; detailed construction programs of Western utilities; activities of federal agencies; detailed sales and wiring plans; over-all interpretation.

CENTRAL SPANG CONDUIT

...PROVIDES LIFETIME PROTECTION!

EASY-TO-WORK Spang CW and Spang Lapweld . . . the finest, full standard weight types of pipe made . . . are used to make Central Rigid Steel Conduit. That's why it has strong walls, full weight and good fatigue resistance. These qualities are your assurance that Central Rigid Steel Conduit will resist crushing and that it will withstand vibration.

Both the inside and outside of Central Rigid Steel Conduit are given a permanent, elastic black enameled or hot dipped galvanized and lacquered finish. Consequently, you can depend upon Central Rigid Steel Conduit to resist severe conditions of corrosion.

But that's not the whole story.

Central Rigid Steel Conduit has a carefully prepared, smooth inside surface which enables wire to be pulled through or withdrawn fast and easy. It has an accurate circular cross section which permits cutting of clean, true threads assuring quick make-up and tight joints. Central Rigid Steel Conduit meets all the National Electrical Code specifications for moisture, vapor and dust proof requirements in hazardous locations and occupancies. And every length is inspected by Underwriters' Laboratories and bears their label of approval.

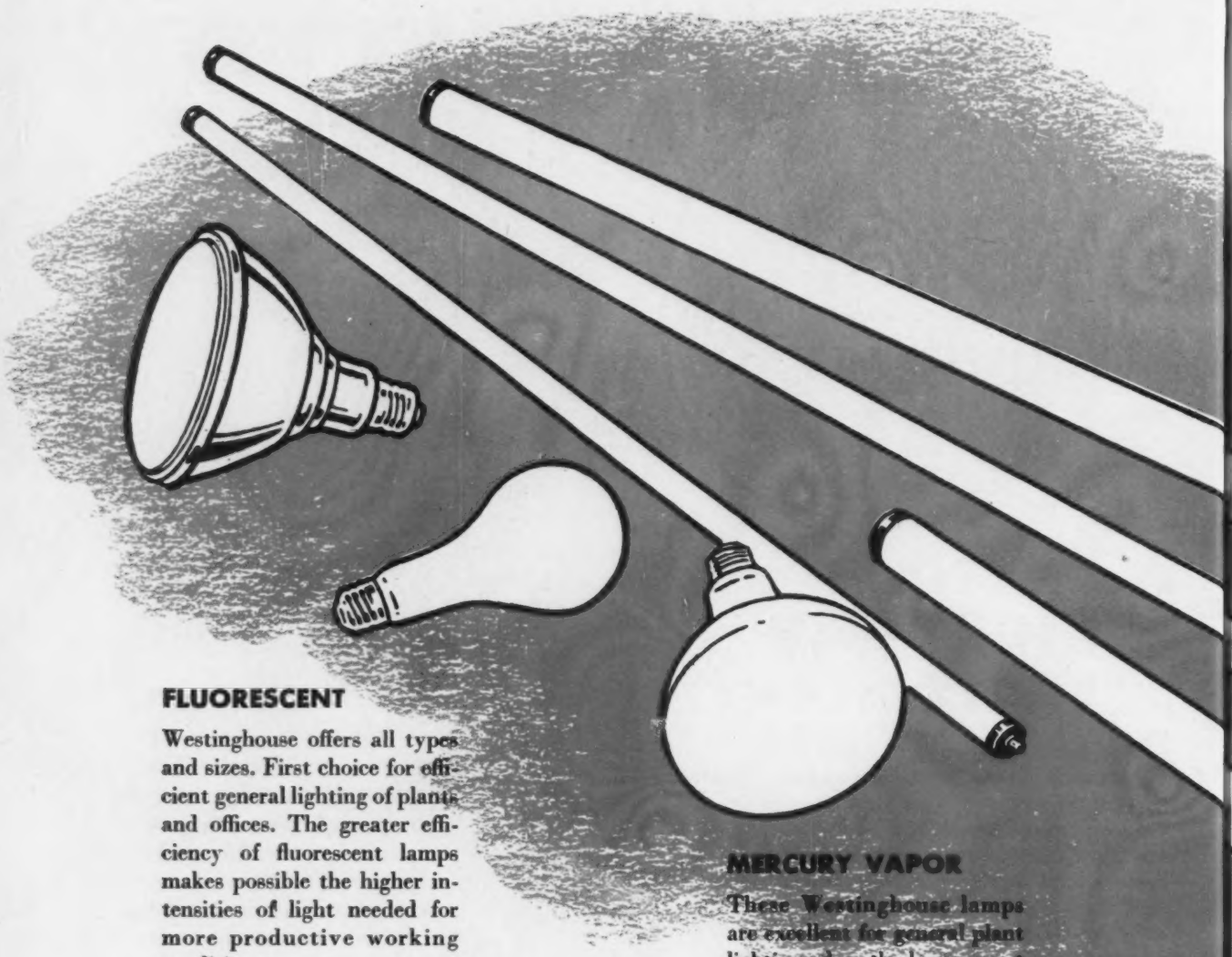
At times your jobber may not be able to supply you with all of the Central Steel Conduit you want. But keep in touch with him. He will make sure you get your share of the available supply.

There's Tested Strength in Every Length . . .

SPANG-CHALFANT

Division of The National Supply Company
General Sales Office: Grant Bldg., Pittsburgh 30, Pa.
District Offices and Sales Representatives in Principal Cities

Threads on Central Rigid Steel Conduit are checked for length, taper and size. Only those that are accurate in every detail are passed. That's why you are always sure of tight fitting joints when you use Central Rigid Steel Conduit.



FLUORESCENT

Westinghouse offers all types and sizes. First choice for efficient general lighting of plants and offices. The greater efficiency of fluorescent lamps makes possible the higher intensities of light needed for more productive working conditions.

MERCURY VAPOR

These Westinghouse lamps are excellent for general plant lighting when the lamps must be installed in high bays and for critical inspection where color distinction is not a factor. High light output per watt makes these lamps efficient to use.

INCANDESCENT

General service lamps up to 1500 watts serve most industrial applications. Westinghouse Projector and Reflector lamps are a simple, convenient means of supplying a directed or a spread beam of light where it is needed.

INFRARED

Available in types and sizes up to 1000 watts, Westinghouse infrared lamps are proving to be the simple, convenient, and economical source of heat for many baking, drying, and heating processes today.

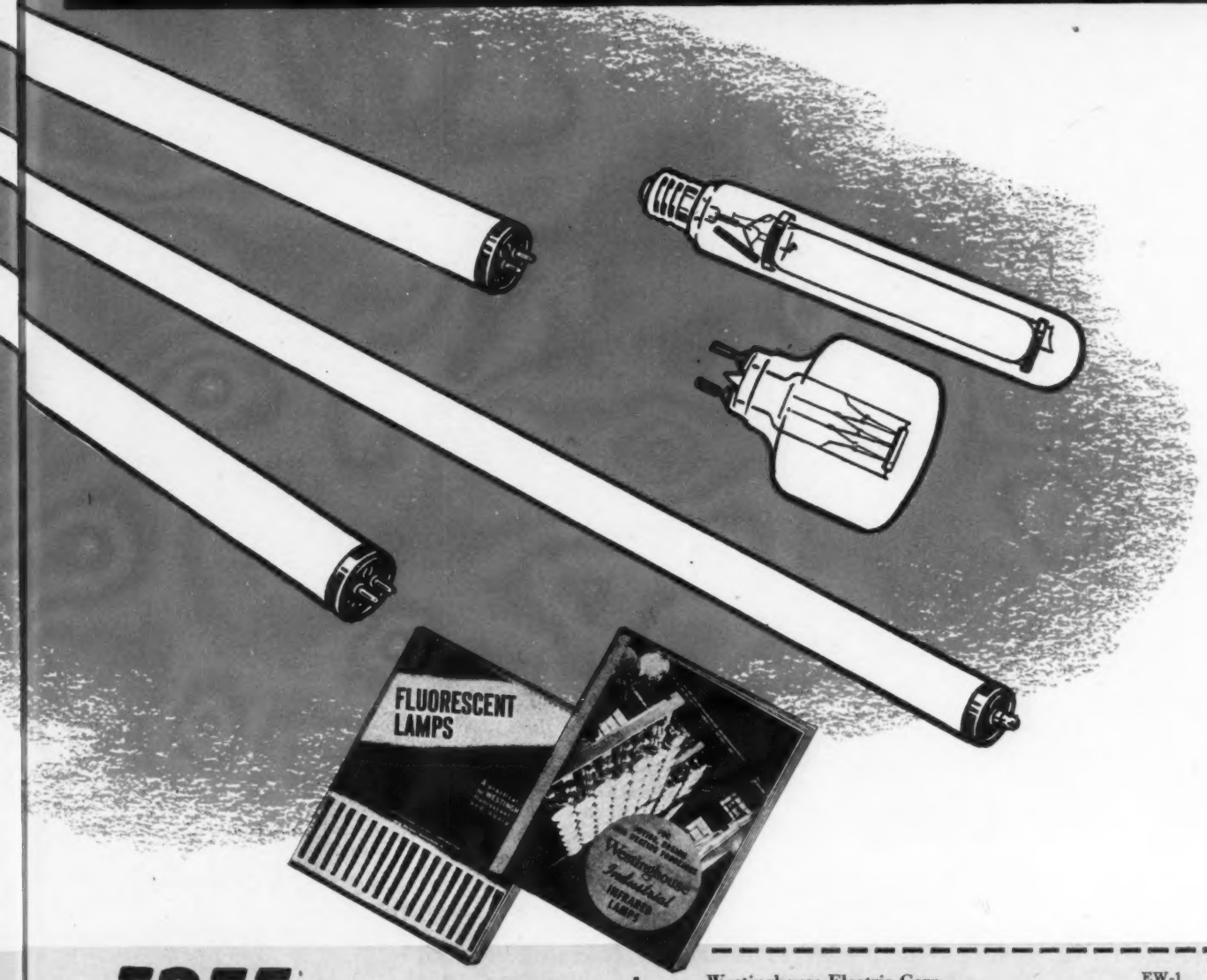
Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

LAMPS FOR SEE-ABILITY

Westinghouse Lamps

FOR EVERY INDUSTRIAL REQUIREMENT



FREE INFRARED AND FLUORESCENT LAMP BOOKLETS

Send today for either or both of these new information booklets. Check and mail the handy coupon. Westinghouse Electric Corporation, Lamp Division, Bloomfield, N. J.

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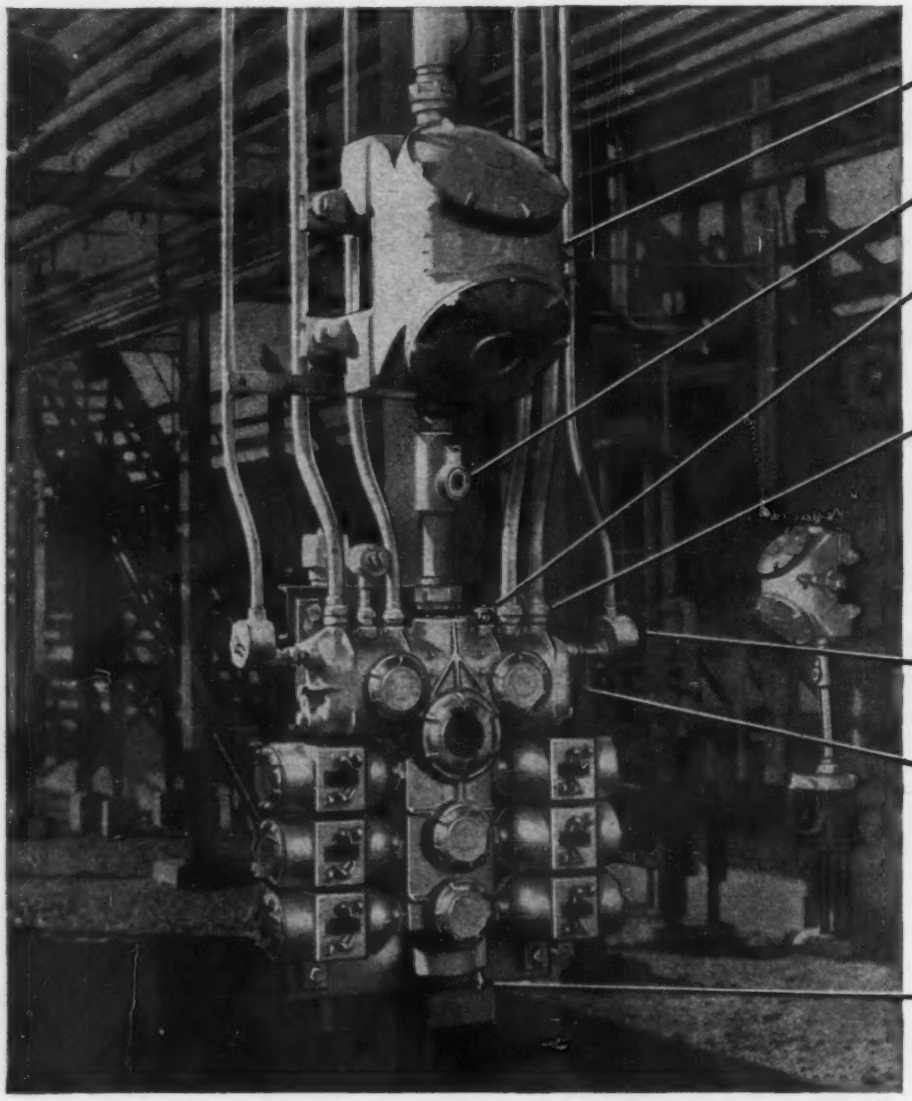
Explosion-Proof

CONDULETS

afford **maximum safety** from explosion and fire

(CONDULETS are made only by CROUSE-HINDS)


Type FLB Explosion-Proof Circuit Breaker Condulet protecting the main lighting feeder
Type EYS Sealing Condulet
Type ECD Breather Valve and Type ECD Drain (shown at bottom of panelboard) ventilate and drain the main wiring compartment
Type UNY Explosion-Proof Union
Type GUAB Explosion-Proof Junction Condulet
Type EDP Explosion-Proof 12-Circuit Lighting Panelboard
Type ECD Drain

Locations where flammable atmospheres are likely to be present are designated as hazardous by the National Electrical Code. The Code requires explosion-proof electrical installations in such locations. Crouse-Hinds Company manufactures hundreds of explosion-proof CONDULETS, lighting fixtures, plug receptacles, and other equipment that affords maximum safety by preventing explosion and fire.

They are described in Crouse-Hinds Condulet Catalog 2509. Write for a copy.

A Nationwide Distribution Through Electrical Wholesalers

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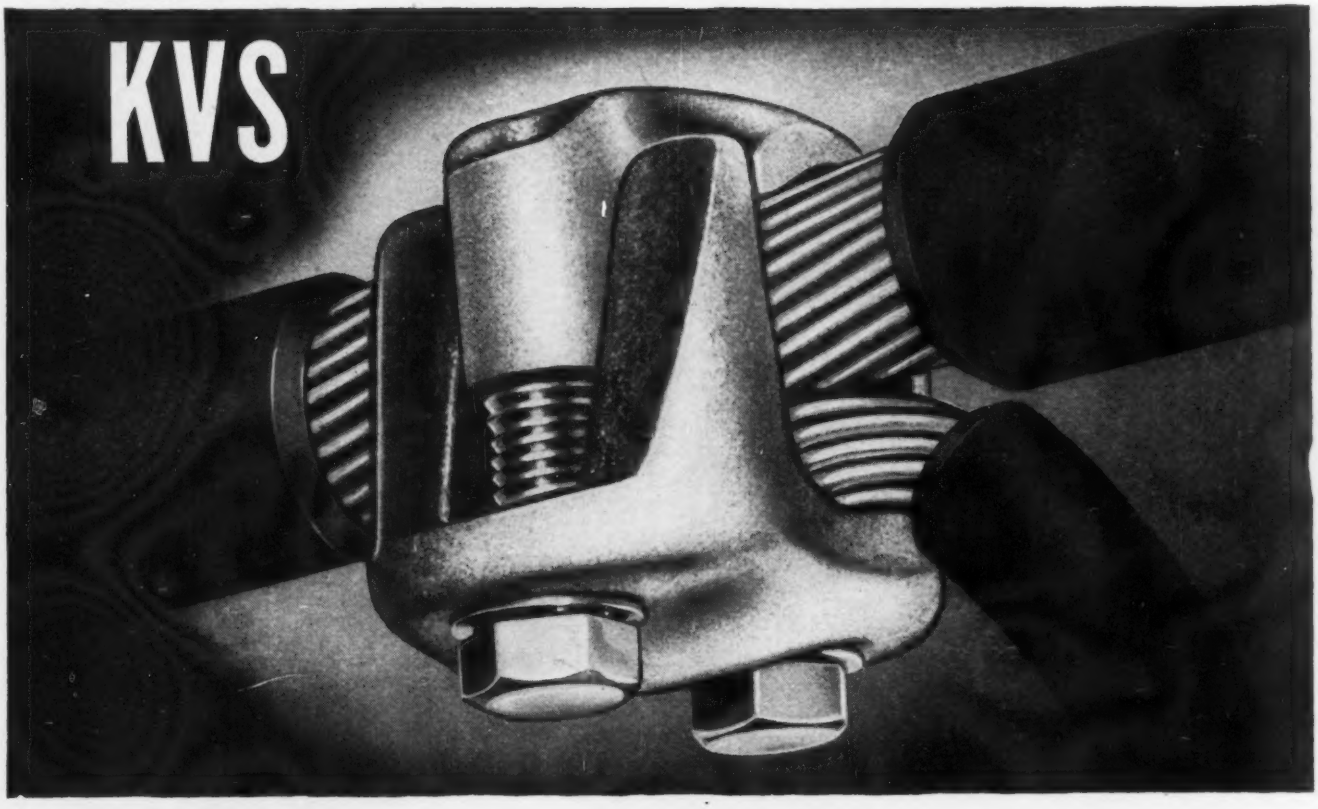
CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

BURNDY OKLIP

TYPE KVS

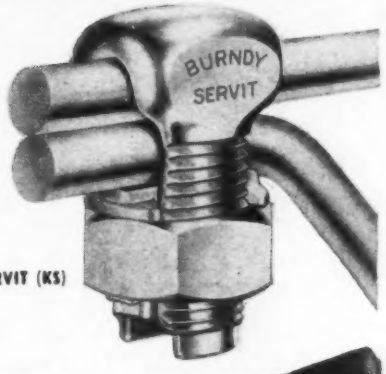


Especially designed for large conductors by completely encircling and firmly forcing them into high pressure contact. Five sizes take all conductors from 4/0 to 1000 Mcm. Rapidly installed with an ordinary wrench. Compact design and rounded edges permit easy taping. KVS is made of high-strength bronze alloy. Write your local Burndy representative or direct to factory.

BURNDY • NEW YORK 54 • N. Y.

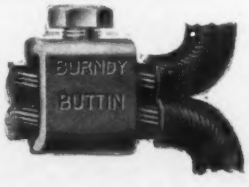
In Canada: Canadian Line Materials, Ltd., Toronto 13
Foreign: Philips Export Corporation, New York 17

OTHER BURNDY FAVORITES:

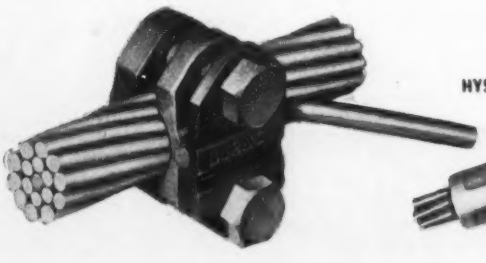


SERVIT (KS)

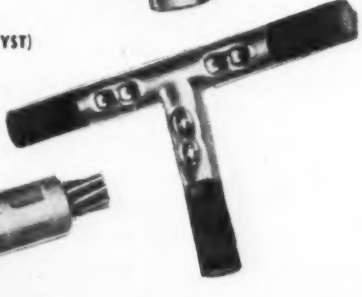
BUTTIN (KP)



ARMOR ROD CLAMP (BPG)



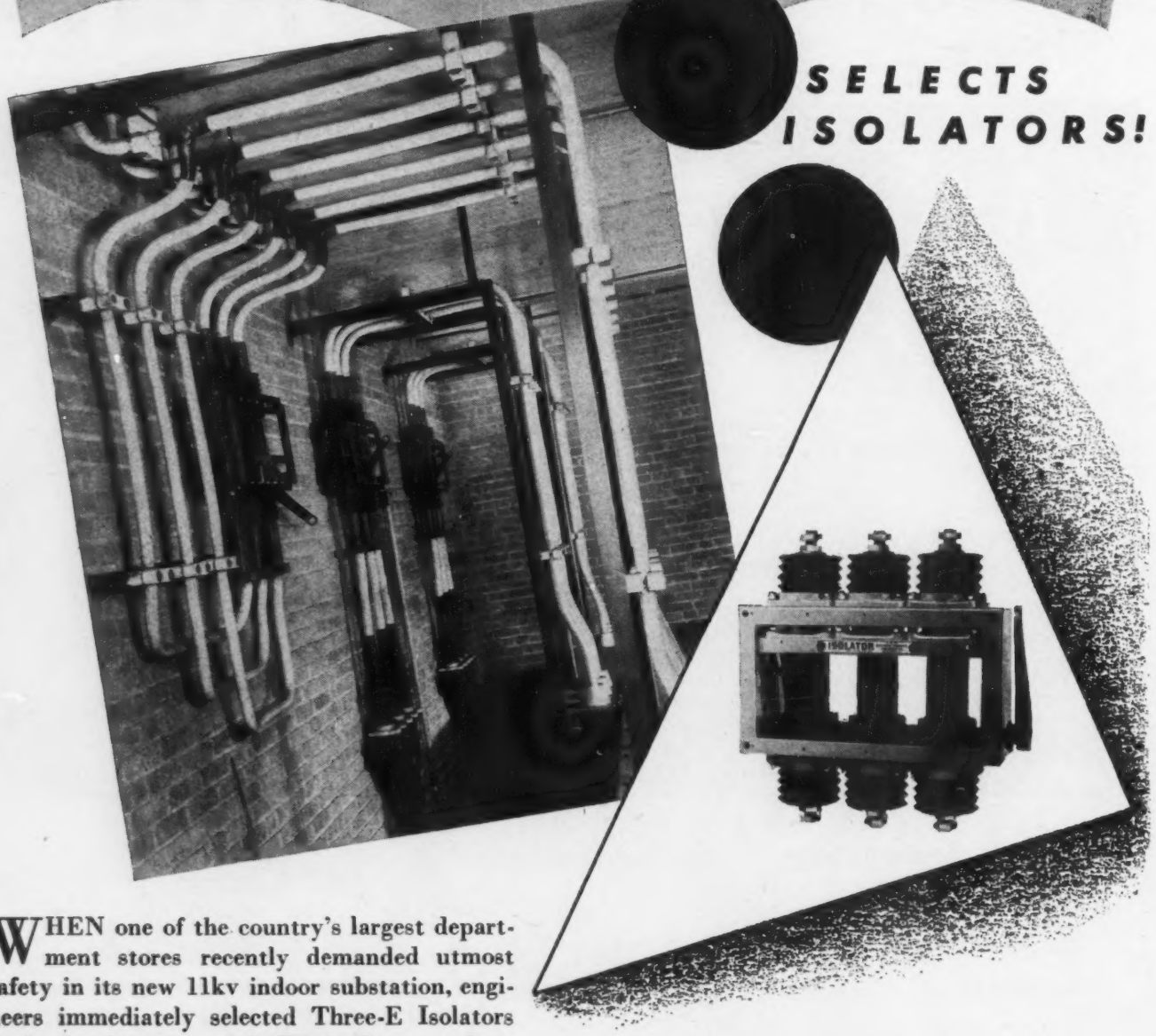
HYTAP (YST)



HYSPLICE (YCS)

DEMANDS MAXIMUM SAFETY

SELECTS ISOLATORS!



WHEN one of the country's largest department stores recently demanded utmost safety in its new 11kv indoor substation, engineers immediately selected Three-E Isolators to do the disconnect job. Why? Because there are no exposed live parts hazarding employees unfamiliar with high voltage.

The isolators' telescoping contacts are fully enclosed in porcelain. The terminals too are completely insulated with bakelite tubing and taped. Here is full protection at low cost . . . yet, safety is only one advantage★of the Three-E Isolator.

There is an isolator to meet your specific requirements. Why not let Three-E field engineers show you isolator advantages . . . with no obligation, of course.

Other Advantages of *ISOLATORS*

- ★ Saves Space
- ★ Saves Connections
- ★ Saves Barriers
- ★ Saves Labor
- ★ Saves Insulators
- ★ Saves Steel

Ask for descriptive Bulletin No. 135

Address Department C

THREE E — ELECTRICAL ENGINEERS EQUIPMENT CO. — MELROSE PARK, ILL. U.S.A. — THE MARK OF QUALITY

ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK ILLINOIS

He writes only in RED INK!

INADEQUATE WIRING, the industrial jinx, embezzles millions every year. It would take quarts of red ink to record the toll he takes in unproductive wages, lost production and spoilage.

For, when he attacks, through overloaded, over-extended, obsolete wiring, efficiency can drop from 25 to 50 percent.

To shut out this costly scribe, talk to your plant power engineer, consulting engineer, electrical contractor or power salesman.* They can write him off... before he gets into your books.

47436

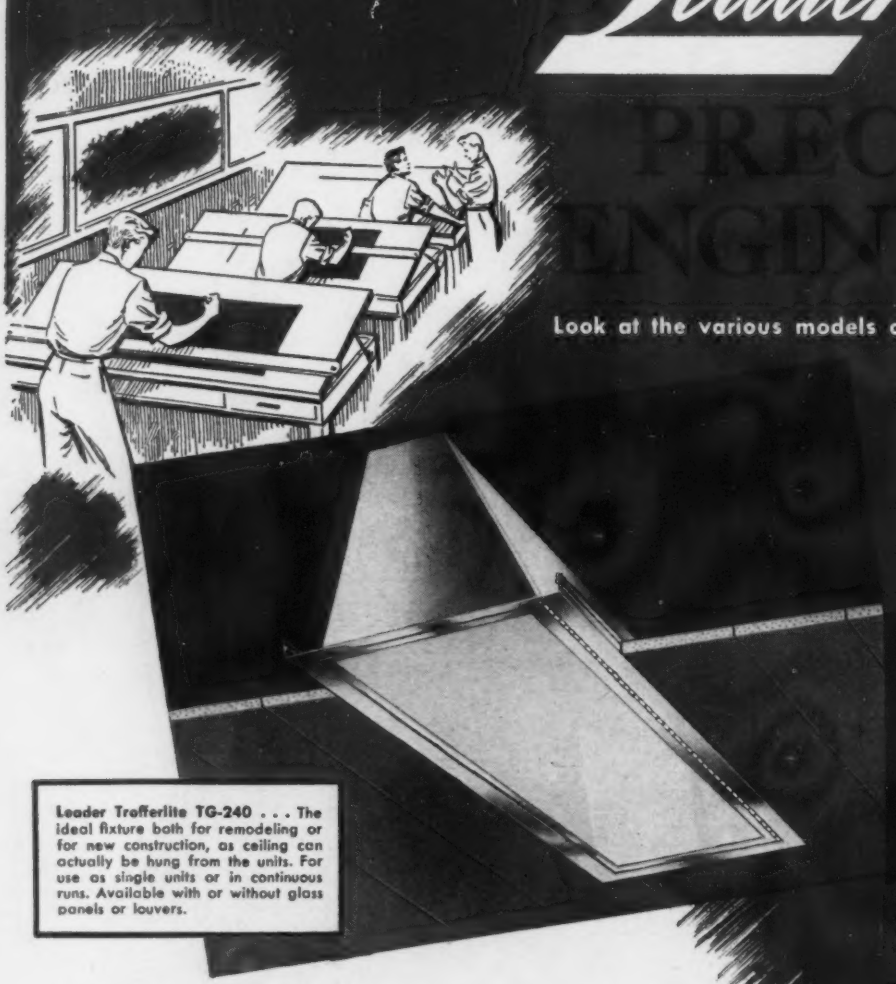
*WIRE AHEAD, a new booklet discussing preventive maintenance... the symptoms of inadequate wiring... and presenting plans for anticipating electrical demand, is now in preparation. We shall be glad to send it on request as soon as it is available.

ANACONDA
from mine to consumer

ANACONDA WIRE & CABLE COMPANY

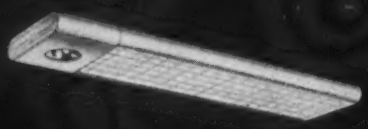
LOOK TO *Leader* FOR

PRECISION ENGINEERING



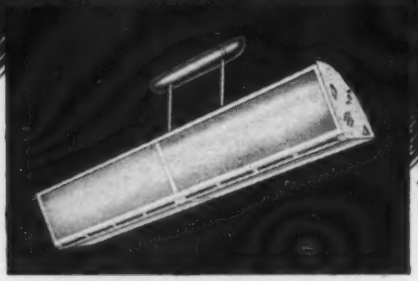
Look at the various models of Leader Fluorescent Luminaires, from any angle. You'll readily see that every Leader fixture is engineered to exacting standards, for simple, easy installation and for years of trouble-free service.

Leader Trofferlite TG-240 . . . The ideal fixture both for remodeling or for new construction, as ceiling can actually be hung from the units. For use as single units or in continuous runs. Available with or without glass panels or louvers.



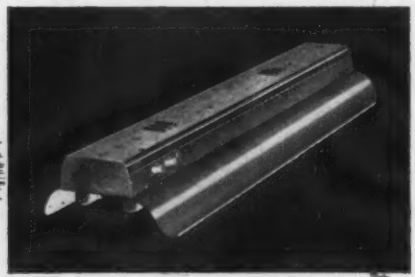
Leader Officer VL-440, with adjustable Direclite... A striking example of Leader's advanced modern design. Wafer thin. High gloss white enamel louvers give maximum soft light diffusion. Direclite, for "spotlight" merchandising.

Leader's advanced engineering features make certain *correct* installation for every lighting need. For example, Leader Trofferlites give the appearance and performance of a custom built installation through the use of standard fixtures. Yes, Precision Engineering contributes much to the popularity of Leader Luminaires with "Big Business" as well as "Little Business" all over America. So, for latest lighting techniques, simple installation, and easy maintenance, Look to Leader.



Leader Glass Enclosed Unit GL-440 . . . Brings luxury lighting within the reach of all! Ribbed glass construction with moderate diffusing louver for plenty of soft, pleasing light. Excellent for schools, stores, offices.

Only better electric wholesalers have Leader franchises. There is a Leader representative in your area.



Leader Stratoliner IUO-240 . . . A durable, heavy duty industrial unit. Excellent for continuous runs. Easily installed; eliminates all installation "extras."

LEADER ELECTRIC MANUFACTURING CORP.

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Prefabrication Means Known Performance

With BullDog BUStribution DUCT

THERE are two ways to install electrical systems.

One way—*the old way*—is to have the system fabricated on the job site. Until the installation is complete, such vital operating characteristics as voltage drop and temperature rise will be deep, dark mysteries.

Voltage drop can plague your plant by cutting the power and efficiency of motors . . . dragging the output of lighting fixtures down below par. And excessively high operating temperatures are bound to take their toll by impairing performance and shortening the life of the electrical systems.

No Other Systems Offer So Much

The *new way* is the BullDog way, where prefabrication means known performance. BullDog Plug-In Type and BullDog Lo-X Feeder Type BUStribution DUCT are both built in standardized, prefabricated sections, laboratory-tested to provide accurate performance data *in advance of installation.*

No other system can offer this cost-saving feature, so call your nearby BullDog field engineer and learn more about the many advantages of BullDog BUStribution. He'll show you a successful installation near your own plant . . . and he'll be on the job to help when the time comes to design your system.

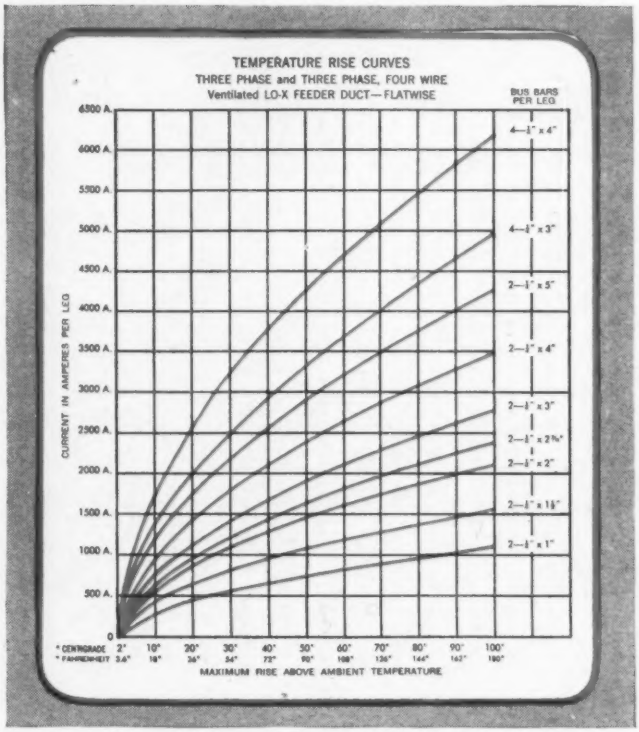
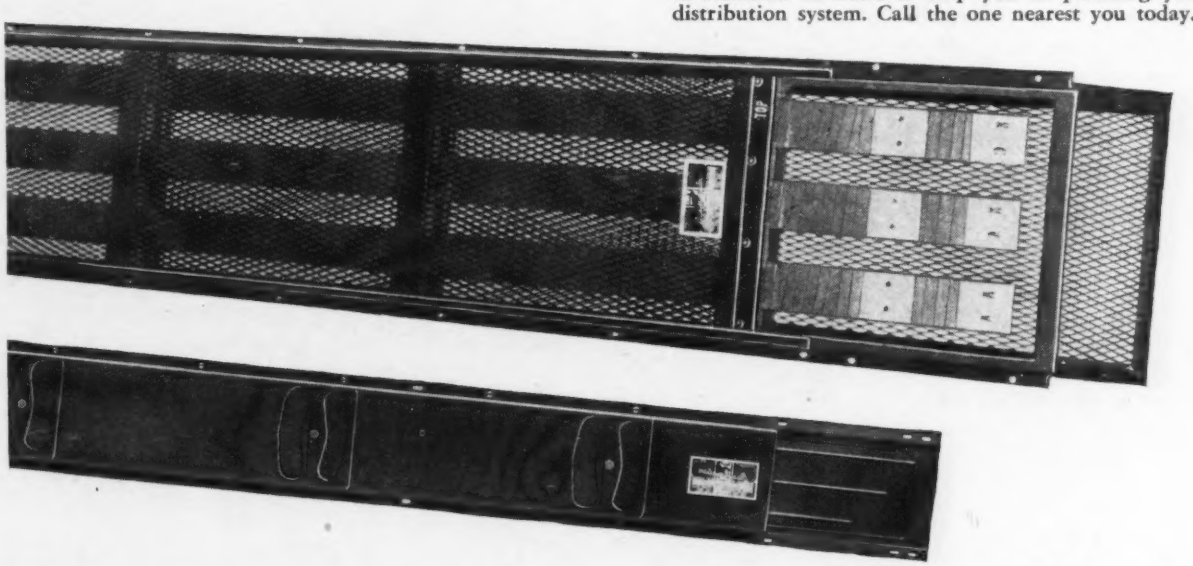


Chart shown is typical of the data on voltage drop and temperature rise available in advance of installation for all types of BullDog BUStribution DUCT. BullDog field engineers have this information at hand to help you in planning your electrical distribution system. Call the one nearest you today.



ADEQUATE WIRING SERVES AND SAVES

BULLDOG

ELECTRIC PRODUCTS COMPANY

BullDog manufactures Vacu-Break Safety Switches—SafToFuse Panelboards—Superba and Rocker Type Lighting Panels—Switchboards—Circuit Master Breakers—"Lo-X" Feeder BUStribution DUCT—"Plug-in" Type BUStribution DUCT—Universal Trol-E-Duct for flexible lighting—Industrial Trol-E-Duct for portable tools, cranes, hoists.

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For Positive Performance . . .
Ample Interrupting Capacity

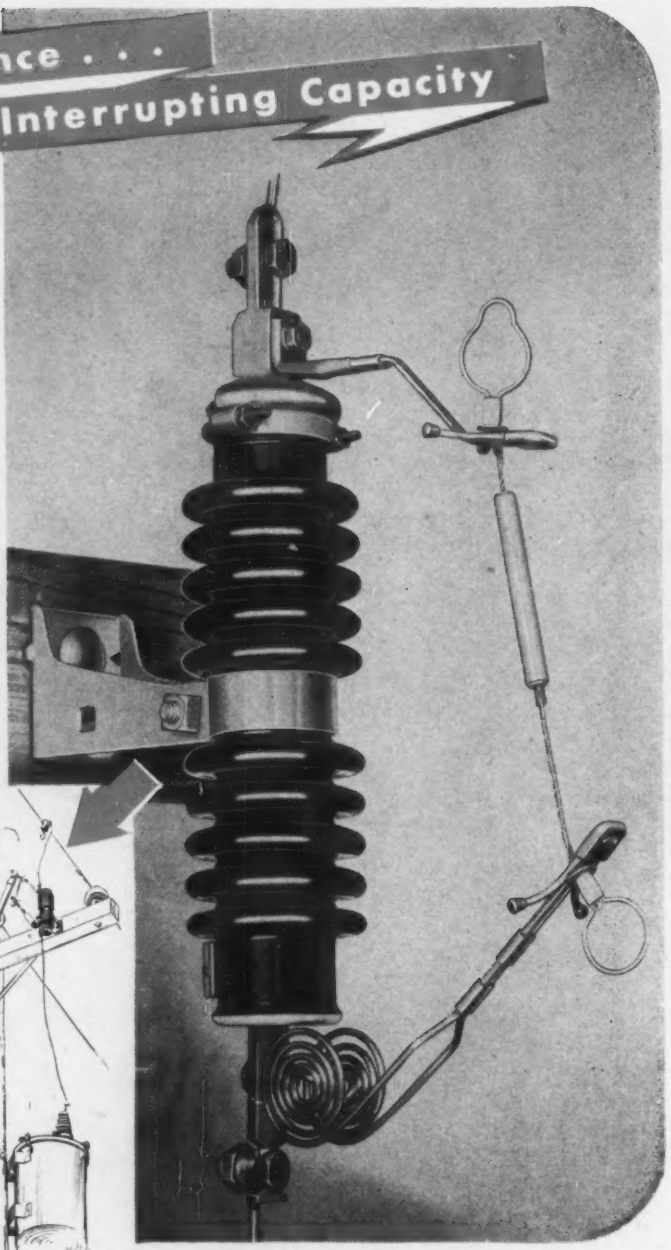
Plus **Low Cost Protection**
Use Kearney

TRIP-O-LINK
Fuse Cutouts

These practical, dependable Kearney Trip-O-Link fuse cutouts provide the economical protection that is necessary on low revenue lines.

This original Kearney patented design—the single unit link and cartridge construction—provides a new arc extinguishing cartridge with each fuse link replacement.

To be assured of positive performance and ample interrupting capacity at low cost use Kearney Trip-O-Link fuse cutouts. Available in 50 and 100 ampere sizes, made in single shot and two shot reclosing types.



At left: Kearney Trip-O-Link Protects a 5000 Volt Rural Line

Specify

KEARNEY PRODUCTS

MAYDWELL & HARTZELL
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What Do You Want in Switchgear?

MOST OPERATORS TODAY ARE LOOKING FOR 3 BIG THINGS IN MODERN METAL-CLAD SWITCHGEAR — SAFETY, LOW MAINTENANCE, AND EASY INSTALLATION!

YES, Allis-Chalmers metal-clad switchgear gives you the three things most important to the average operator — through the features of advanced design outlined at right.

Equipped with magnetic air, oil, or air blast circuit breakers, Allis-Chalmers metal-clad switchgear is adapted to every industry and utility application, indoor or outdoor!

You'll like the fact that circuit breaker units are interchangeable for same rating and type of breaker . . . and saving of aisle space by compact vertical lift construction. It all adds up to your greater convenience!

Get full details on metal-clad, vertical lift switchgear by contacting our nearby sales office. Or write directly to ALLIS-CHALMERS, MILWAUKEE 1, WIS.

☑ **Want Simple Installation?** You'll get it with completely factory-built, wired and assembled Allis-Chalmers switchgear units . . . easy to install, and more units can be added in the future without trouble. Lining up just four points — not eight — saves installation time!

☑ **Want Easy Maintenance?** Note these Allis-Chalmers metal-clad switchgear details: Removable plates for access to bus and instrument transformer compartments, circuit breaker, and secondary wiring; "hinged" wiring connection eliminates wear or bending on wires when door is opened or closed; special method of insulating busbars does away with using compound filling for bus joints.

☑ **Want Safe Operation?** You get that, too, when you specify Allis-Chalmers switchgear. Isolation of units, *fully automatic* disconnect shutters, and positive interlocks on elevating mechanism are a few of the details adding up to *safety* for operators!

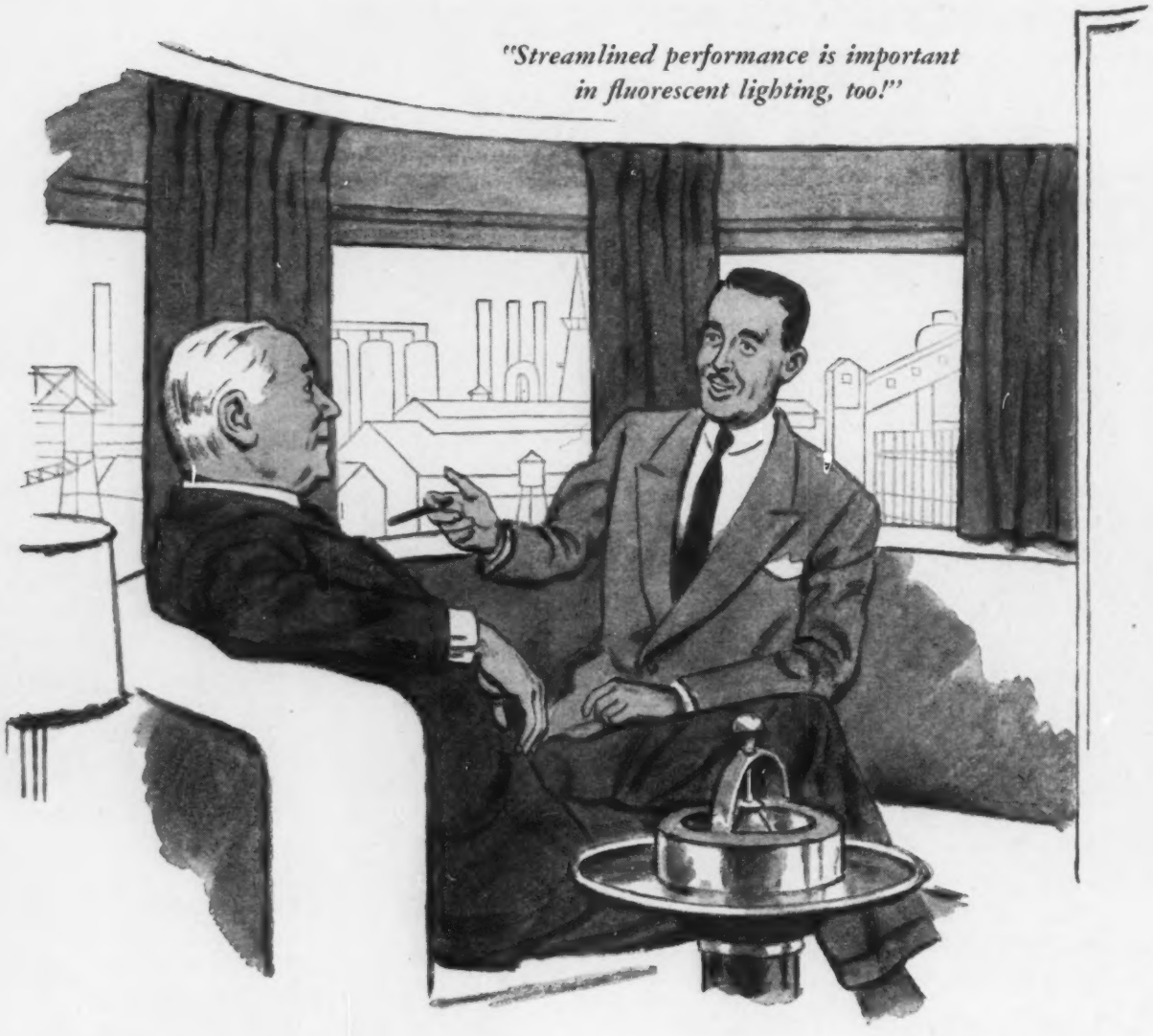
A 2076

ALLIS-CHALMERS

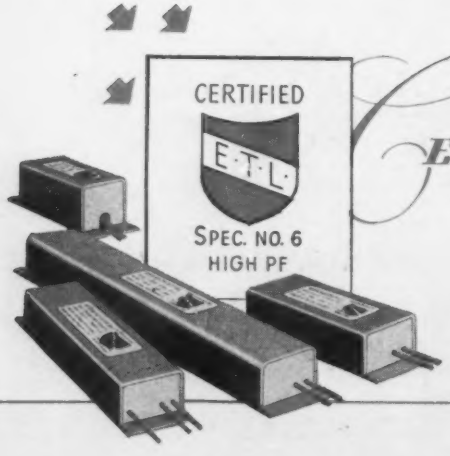
One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

METAL-CLAD *Switchgear*

"Streamlined performance is important in fluorescent lighting, too!"



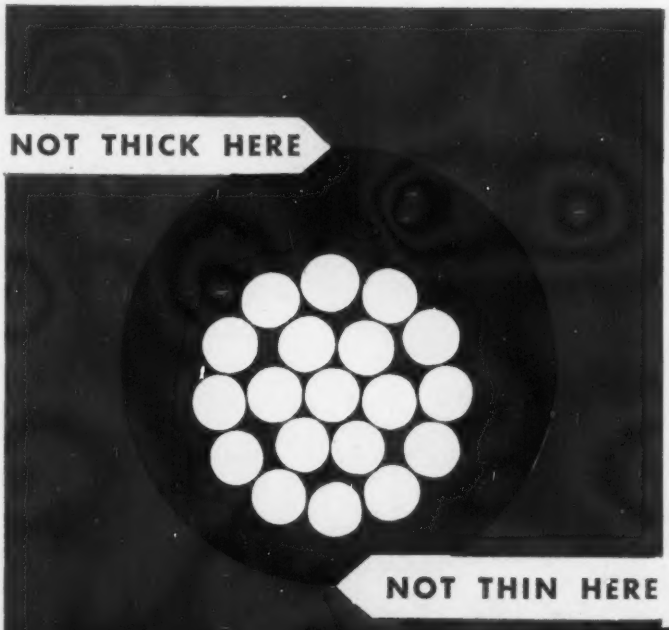
...And there's a way to assure it—through Certified Ballasts. The ballast, in a fluorescent lighting fixture, is the *heart* of the lamp and fixture *operation.* And Certified Ballasts, built to exacting specifications, tested, checked and CERTIFIED by independent experts, Electrical Testing Laboratories, Inc., as definitely meeting those specifications, mean—to you—longer fluorescent lamp life—most light from lamps—greater economy. Insist on the ETL Certified label on the ballasts you specify and use!

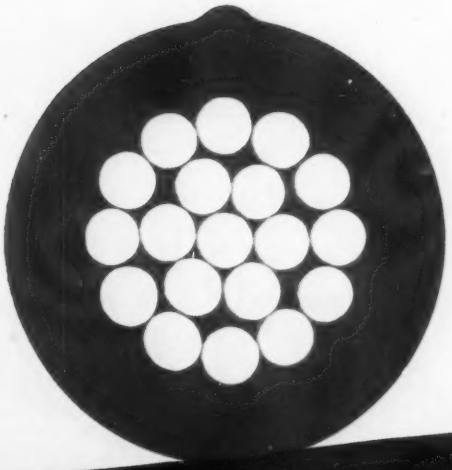


CERTIFIED BALLAST MANUFACTURERS

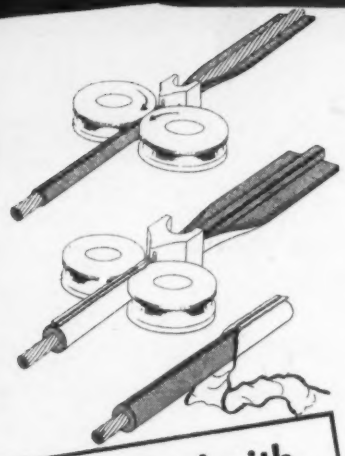
Makers of Certified Ballasts for Fluorescent Lighting Fixtures

Acme Electric Corporation, Cuba, New York
Chicago Transformer Div., Essex Wire Corporation, 3501 Addison St., Chicago, Illinois
General Electric Co., Specialty Transformer Division, Fort Wayne, Ind.
Jefferson Electric Co., Bellwood, Illinois
Sola Electric Co., 2525 Clybourn Avenue, Chicago 14, Illinois
Starring and Company, Bridgeport, Conn.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.





. . . but PERFECTLY-CENTERED Conductors the OKONITE way



Only Cables insulated with OKONITE give you all 5

1. Conductors better protected from corrosion by an Okoloy coating over the copper.
2. Long-lived insulation, made with wild Up-River Fine Para rubber, carefully washed and dried.
3. Foot-by-foot inspection of the insulation strips before and during their application to the wire.
4. Perfect centering of conductors by the Okonite strip-insulating process.
5. Greater density, uniformity and higher electrical values through vulcanization in a continuous metal mold.

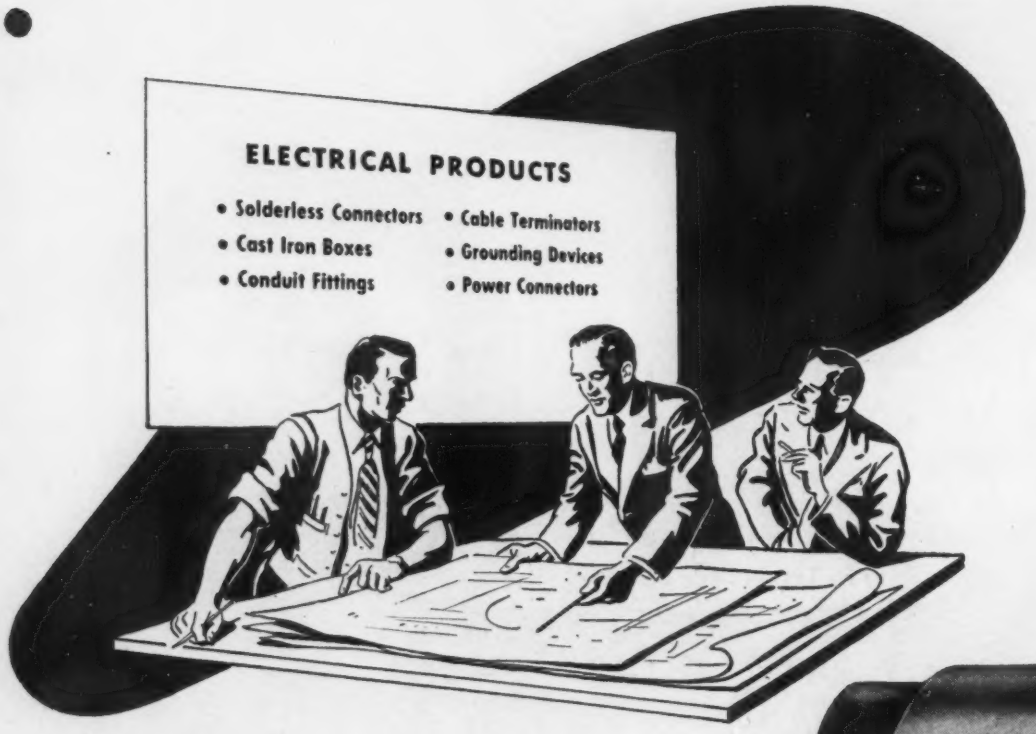
Okonite's strip insulating process assures perfect centering of the conductors in electrical wires and cables. This method automatically eliminates uneven walls of insulation, removing any chance of failure from this cause.

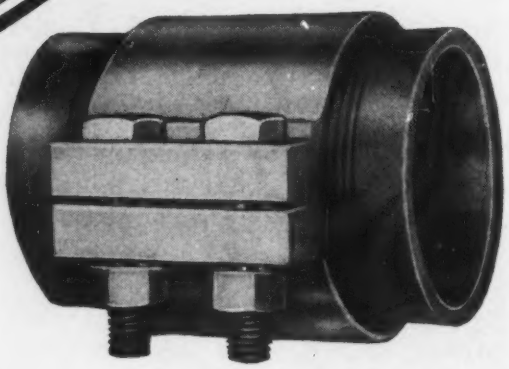
In the Okonite process, strips of rubber compound of the exact thickness required are individually folded around the conductor, automatically centering it. The insulation is open to inspection during the entire insulating operation.

The final strip is backed by sheet tin, and when applied forms a continuous metal mold for vulcanizing. In this mold, heat is transmitted evenly through the entire length of the cable, so that every foot receives the same "cure". When the mold is removed, there remains a wall of dense, homogeneous Okonite rubber insulation that is uniform in thickness throughout.

Bulletin 101 gives you further information on the rubber used in Okonite insulation and the method of applying it. Write for a copy. The Okonite Company, Passaic, N. J.

OKONITE insulated wires and cables





SPLIT COUPLINGS . . .
CONTRACTORS SAY THEY'RE O.K.

if they're O.Z.

CONTRACTORS reduce today's building costs TWO ways by specifying Split Couplings by O.Z.

ONE INITIAL PURCHASING COSTS ARE KEPT TO A MINIMUM. The simple one-piece malleable iron construction insures a low priced, high quality product.

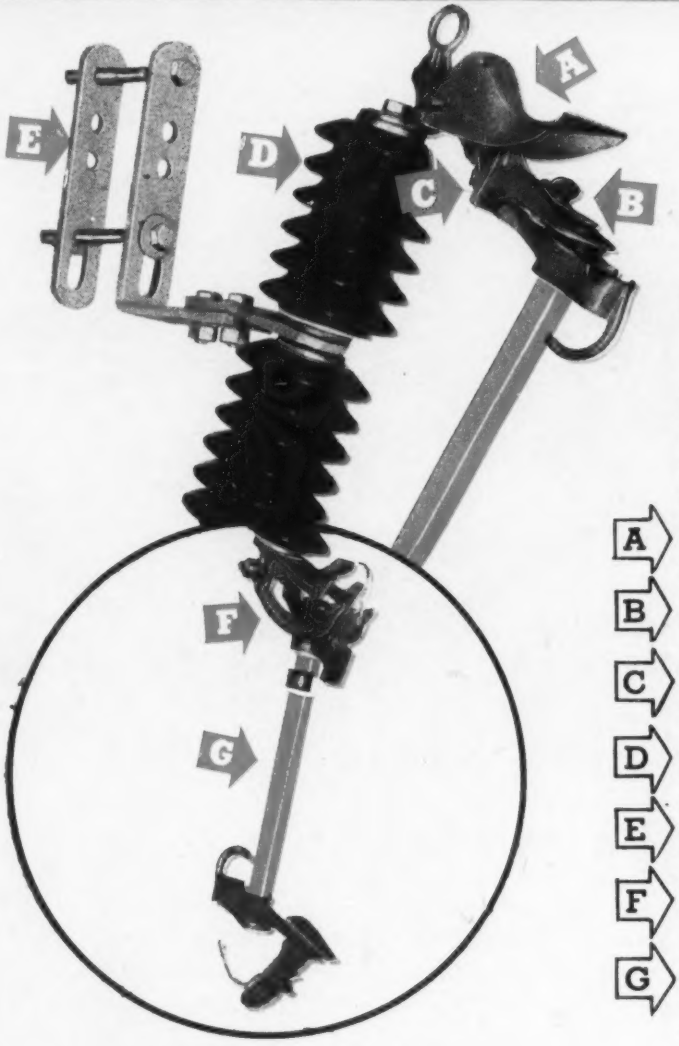
TWO INSTALLATION COSTS ARE REDUCED. The Split Coupling is normally spread open so that it easily slips over the ends of the conduits to be joined. Then by merely tightening the nuts, the butted ends of the conduits are fastened together. Note particularly that the only operation required is turning the nuts—the heads of the screws are restrained from moving by the shoulder on the outside of the Coupling.

O.Z. ELECTRICAL MANUFACTURING COMPANY
262 BOND STREET · BROOKLYN, 2 N. Y.

For details on these and other electrical products in the complete O.Z. line, get in touch with your local O.Z. distributor. He's set up NOW to serve your requirements from stock.

280

DEPENDABLE PROTECTION WITH



Type 33 Dropout CUTOUTS

For almost a Quarter of a Century, Southern States Dropout Cutouts have set the standard for the industry. Today's "Type 33s" are providing dependable protection on distribution lines throughout the world.

- **A** Sleet-shield top latch provides dependable operation under all weather conditions.
- **B** Positive dropout action is assured by knee-action mechanism at top and bottom of tube assembly.
- **C** Dependable operation at full rated current is assured by evenly distributed pressure and full wiping action of solid copper contacts.
- **D** Insulator replacement costs are lower with Southern States two-piece insulator units.
- **E** Universal mounting bracket provides either cross-arm or pole mounting.
- **F** Self-locking hinge prevents tube falling out on down swing.
- **G** Positive semaphore! Completely open position provides unmistakable indication of blown fuse. Tube quickly and easily removed and replacement installed with hook stick.

Available in voltages from 5kv to to 15kv and from 50 to 300 amps

Investigate Southern States Dropout Cutouts today! Write for Bulletins on the entire line.

Southern States Equipment Corp.

HOME OFFICE AND FACTORY — HAMPTON, GEORGIA

REPRESENTATIVES IN FOLLOWING CITIES:

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LOS ANGELES, CALIFORNIA
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MIAMI, FLORIDA
ATLANTA, GEORGIA
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VALPARAISO, INDIANA
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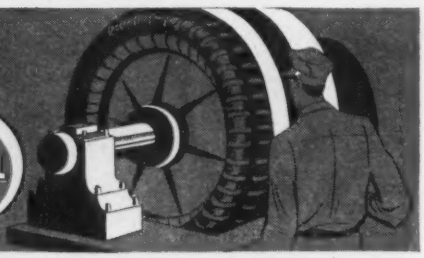
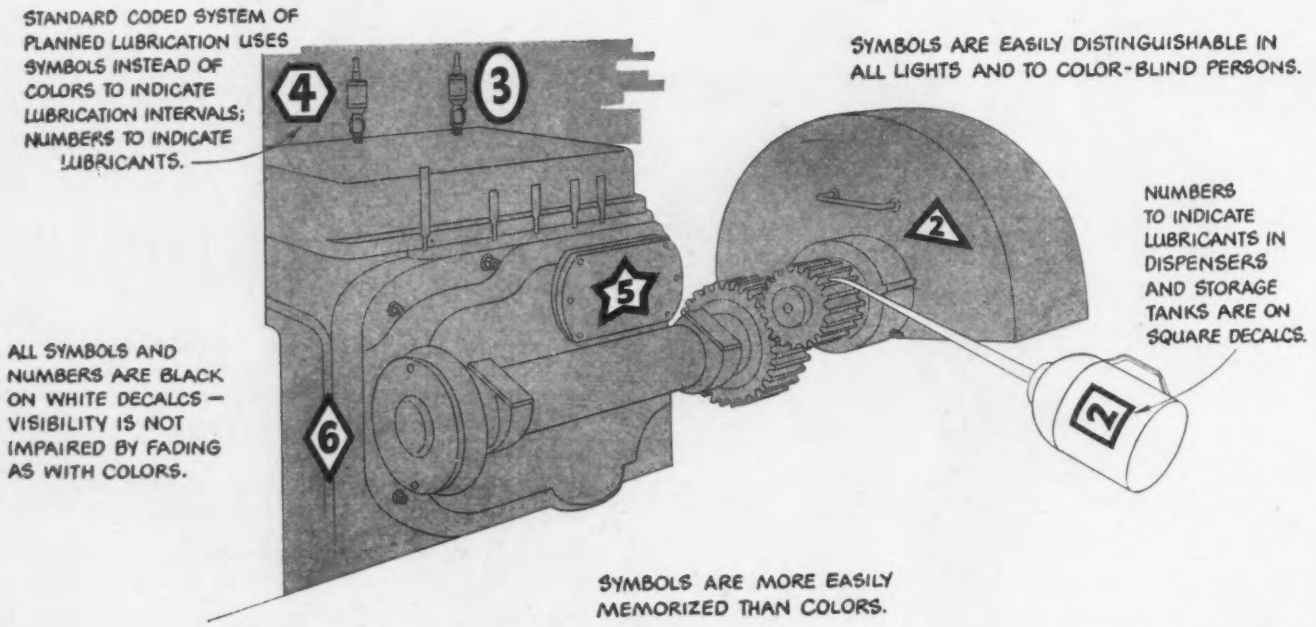
SEATTLE, WASHINGTON
MILWAUKEE, WISCONSIN

STANDARD ENGINEERS NOTEBOOK

CALOL RPM




STANDARD CODED SYSTEM OF PLANNED LUBRICATION USES SYMBOLS INSTEAD OF COLORS TO INDICATE LUBRICATION INTERVALS; NUMBERS TO INDICATE LUBRICANTS.
SYMBOLS ARE EASILY DISTINGUISHABLE IN ALL LIGHTS AND TO COLOR-BLIND PERSONS.
NUMBERS TO INDICATE LUBRICANTS IN DISPENSERS AND STORAGE TANKS ARE ON SQUARE DECALCS.
ALL SYMBOLS AND NUMBERS ARE BLACK ON WHITE DECALCS — VISIBILITY IS NOT IMPAIRED BY FADING AS WITH COLORS.
SYMBOLS ARE MORE EASILY MEMORIZED THAN COLORS.
4
3
2
5
6
2

Free coded marking system stops lubrication mistakes

Here's a new coded system of planned lubrication developed by Standard of California Fuel and Lubricant Engineers for operators in the Seven Western States. It will minimize breakdowns and maintenance costs wherever industrial machinery is used and lubricated.

By employing symbols instead of colors to indicate lubrication intervals, mistakes caused by color-blindness are completely eliminated...and chances of errors due to colors fading or changing appearance under different lighting conditions are avoided, too.

The symbols on decalcs indicate lubrication intervals; numbers inside the symbols indicate lubricants to use.

Standard Fuel and Lubricant Engineers will install the Standard Coded System of Planned Lubrication in your plant at no charge. Decalcs, record charts for each machine, everything needed will be supplied absolutely free.

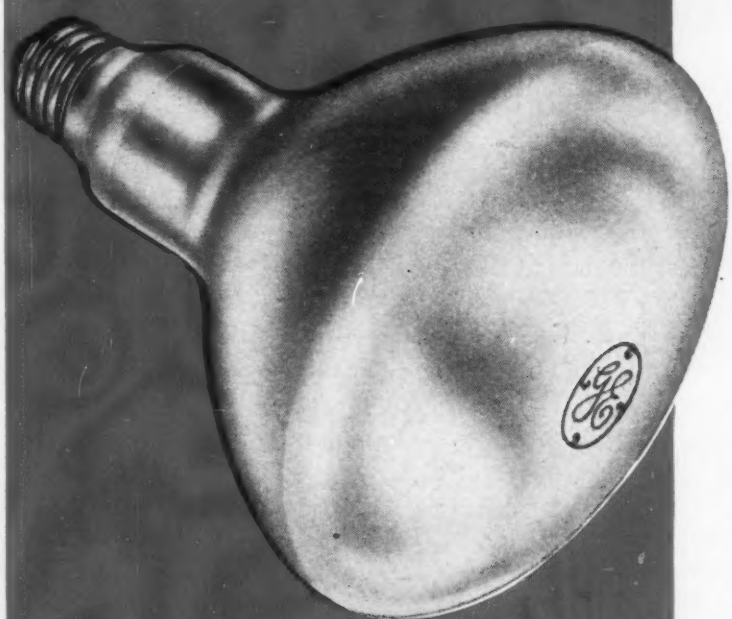
For this service or lubrication help of any kind in the Seven Western States, call your local Standard Representative in that area or write 225 Bush Street, San Francisco, California.

Standard Fuel and Lubricant Engineers are always at your service. They'll gladly give you expert help — make your maintenance job easier. Call your local Standard Representative or write Standard of California, 225 Bush St., San Francisco 20, California

FOR EVERY NEED A **STANDARD OF CALIFORNIA** JOB-PROVED PRODUCT

This G-E
Infra-red Heat Lamp
is a

3 STAR WINNER



G-E LAMPS

GENERAL ELECTRIC

★

1. THE CONSUMER WINS!

A lot of comfort and convenience for a low price. Winter chills and ills create dozens of uses for a G-E heat lamp in every home—it soothes aches and pains, warms folks on chilly mornings, thaws pipes, dries shampooed hair, nail polish, paint, stockings, glue. And everyone can buy this handy lamp right now for only $1.25!

★

2. THE DEALER WINS!

Here's a mid-winter merchandising opportunity that pays off. Right when consumer demand is at its peak, plenty of standard G-E heat lamps are available for immediate delivery—for volume sale at a bargain price. And in January we're backing dealers with a hard-hitting program of special promotion and national advertising on heat lamps.

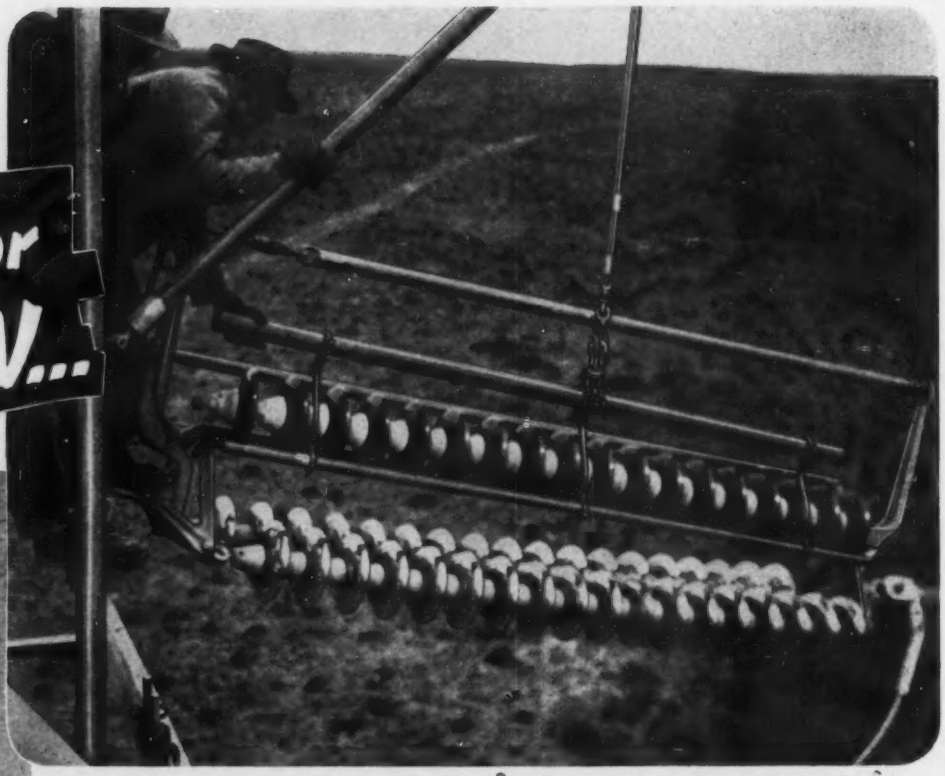
★

3. THE UTILITY WINS!

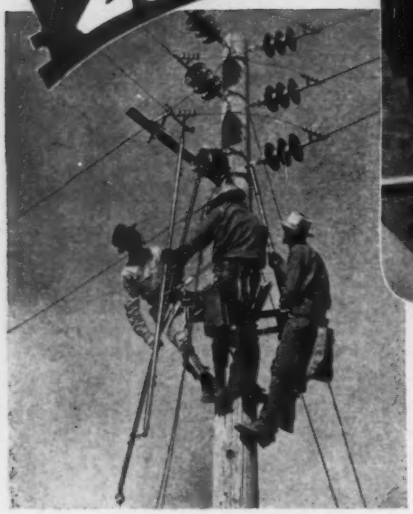
Now's the time to use this popular G-E heat lamp as a door-opener for your home lighting advisors. It's a help in building the friendship of consumers. And it plays an important part in General Electric's program for "bringing the sun indoors." Remember, a 250-watt G-E heat lamp in every home can be a real load-building plus!

Put G-E heat lamps on your winter Promotion Docket

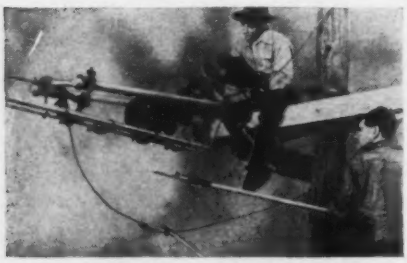
. . . Everybody needs 'em . . . now!
. . . They're priced right!
. . . They're available!



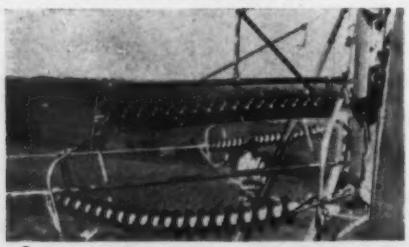
7.5 KV or 230 KV...



Dead end insulators on poles or crossarms (up to 16 KV) can be changed in a matter of minutes with this handy dead end tool.



For higher voltages use the above two-pole strain carrier and cradle combination for single strings. The single pole strain carrier below is made to handle double insulator strings.



DEFECTIVE INSULATORS are replaced HOT with CHANCE (TIPS) TOOLS!

The illustration above shows how Bonneville maintenance crews quickly replace damaged insulators on the 2700-mile, high-voltage Bonneville-Grand Coulee system. One single-circuit dead end tower has six triple string insulator assemblies, or a total of eighteen strings of eighteen insulator units each. With Chance (Tips) Tools, a single crew changes all insulator strings on a tower in 12 hours actual working time.

Whether *your* line maintenance problem is large or small... whether you service thousands of miles of high-voltage circuits or a small rural line, Chance (Tips) Tools make it possible to replace dead end insulators without interrupting service, and with utmost simplicity and safety.

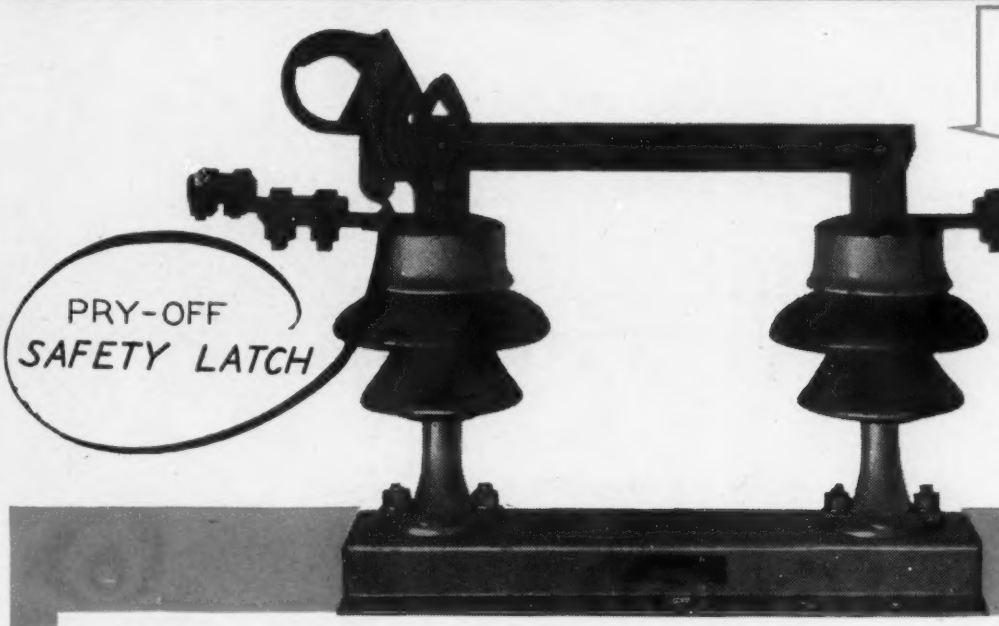
All Chance (Tips) Tools are tested to withstand 75,000 volts per foot of pole. They are available for all types of live line maintenance.

C4613

A·B·CHANCE CO·
CENTRALIA, MISSOURI.
SAN FRANCISCO, CALIFORNIA

ABC INDUSTRIES

LONG LIFE



PACIFIC ELECTRIC Disconnects Type BB-1

200 to 1200 amperes, 7.5 to 34.5 kv. inclusive; and 600 and 1200 amperes, 46 and 69 kv.

WHY do utilities report these Pacific Electric Disconnects the best buy?

1. All nonferrous construction above insulator caps, including bolts, nuts and washers. There's no corrosion, a minimum of adjustments and but little maintenance. Long life is assured.

2. Full conductivity. Tongue contacts have high pressure applied by adjustable spring tension.

3. Double blades of hard-drawn copper have adjustable high-pressure spring washers.

4. Terminal pads are single-piece copper-alloy castings; N.E.M.A. Standard bolt-hole spacings accommodate most specifications. Clamp-type terminals available.

5. Easy to operate, for the first pull on the switch stick opens the safety latch and then exerts a pry-open motion that will break thick ice.

6. N.E.M.A.-B.I.L.-Standard Insulators.

7. Formed steel base, well known for its rigidity. Has flat mounting surface that ends crossarm cutting.

8. Easy installation assured by standard bolt holes spaced properly for a wide range of mounting positions.

Made by Pacific Electric, specialists in the manufacture of switching equipment for 41 years, these outdoor disconnects have long earned preference among utilities the nation over—for simple installation, high conductivity, a minimum of maintenance, ease of operation and long life. Full information is yours for the asking.

Quick shipment of these switches now being made from our new San Jose, Calif., plant.

G. B. Kirkwood
437 S. Hill St.
Los Angeles 13, Calif.

J. E. Redmond Co.
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Myron Swendsen
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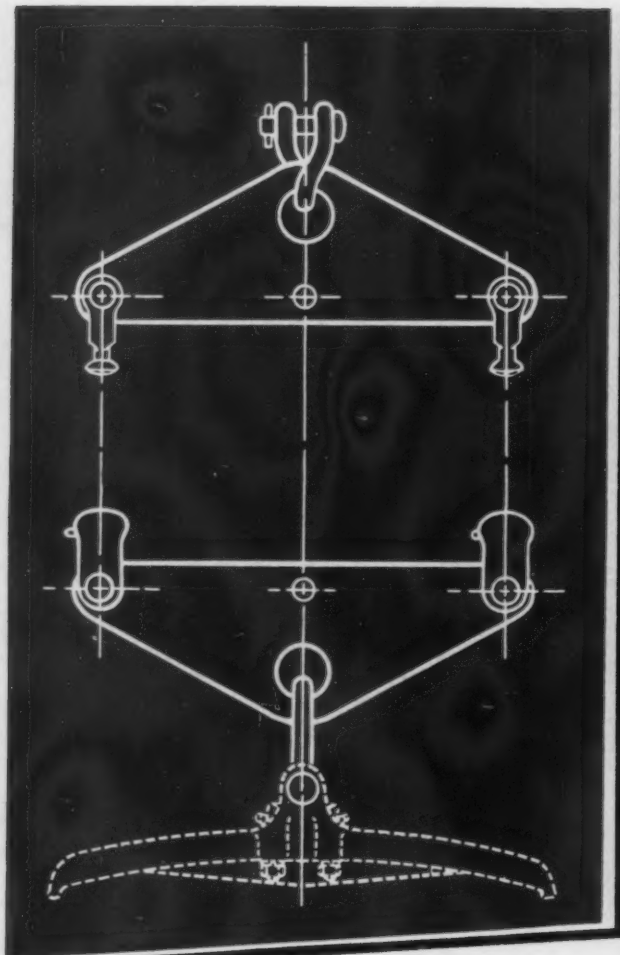
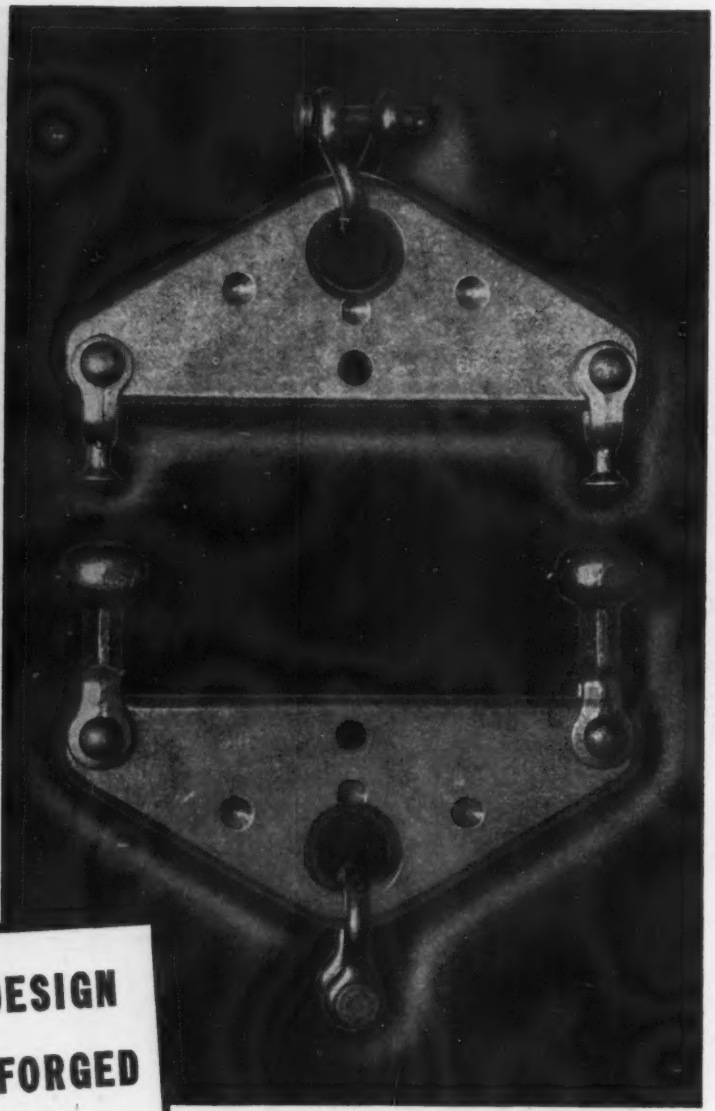
Other Representatives in Principal Cities

PACIFIC ELECTRIC MFG. CORPORATION

5815 Third St., San Francisco 24, Calif. P. O. Box 419, Gary, Indiana





FOR TRANSMISSION LINE DESIGN USE BTC STANDARD DROP FORGED STEEL LINE HARDWARE

for Special Construction Requirements

Unusual conditions can generally be met with Standard Fittings without resorting to the use of parts for which special dies and tools would be necessary

A large South American Transmission Project had a problem involving a high-strength, double insulator string, single Clamp conductor suspension. The definite, limited tower-to-cable string length was unusually short for double yoke construction. Normal insulator flash-over value, and all-direction flexibility had to be maintained.

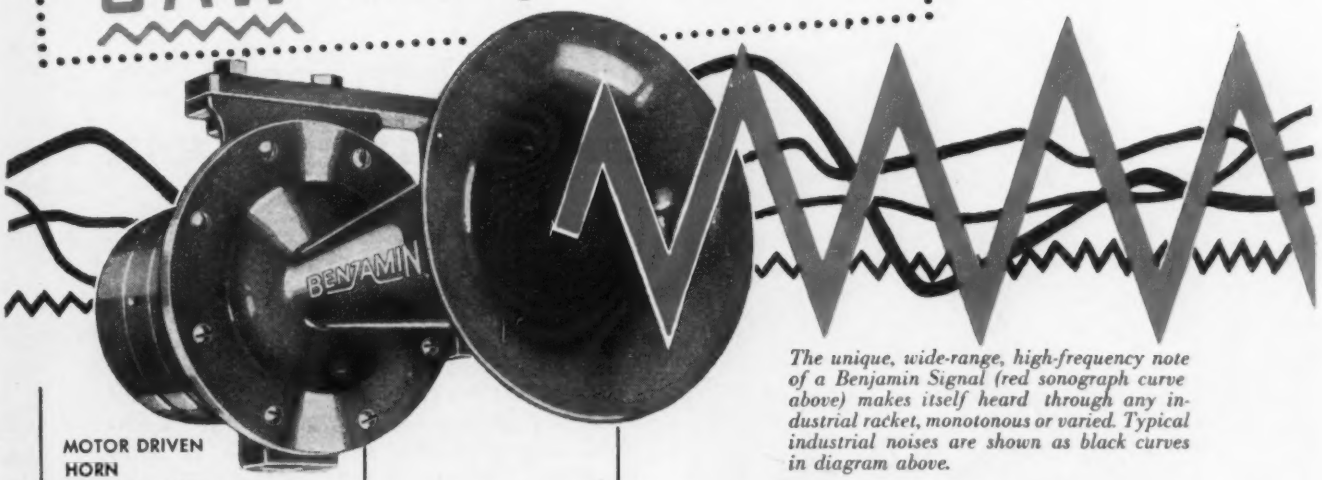
The illustrated B. T. C. design solved the problem and used only *Standard* Forged Steel Yoke Plates and Fittings, machined, formed and assembled to meet the peculiar conditions. The use of Drop Forged Steel Line Hardware allows considerable flexibility of design — Standard parts may be machined or hot-formed to special dimensions without sacrificing essential strength; or heat-treated to increase their inherent strength and resistance to shock and fatigue.

Sold only through your insulator manufacturer

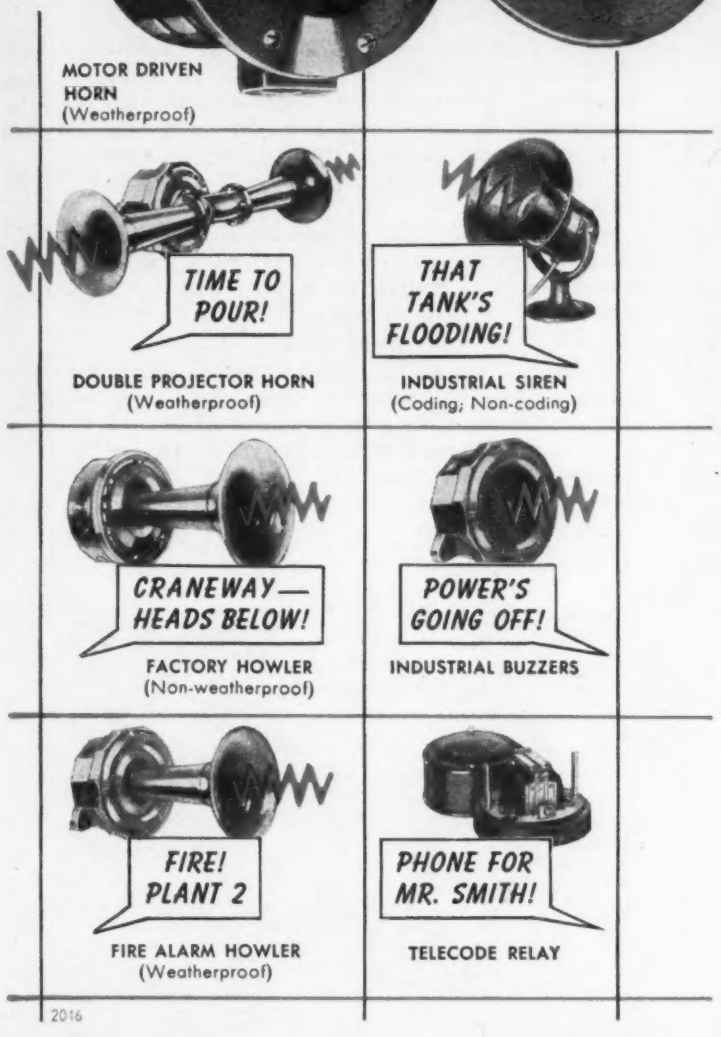
THE BREWER-TITCHENER CORPORATION
CORTLAND, NEW YORK

BTC
DROP FORGED
Hi-Line
HARDWARE

They Warn, They Page, They SAW Through ANY Din!



The unique, wide-range, high-frequency note of a Benjamin Signal (red sonograph curve above) makes itself heard through any industrial racket, monotonous or varied. Typical industrial noises are shown as black curves in diagram above.



FOR executive paging—To locate quickly the men whose duties take them through the plant.

FOR telephone signaling—where noise drowns the phone bell.

FOR alarms and warnings—calling guards or firemen to the right place, for warnings of overflow, breakage and interruptions.

FOR time signaling—process-flow notices, hours-of-work signals.

One of these days, one slight accident to men or equipment will far more than overbalance the cost of a Benjamin Signal installation. Too, a Benjamin Signal installation cuts out the perpetual confusion, delay and annoyance of hunting for wandering, wanted personnel...a real contribution to operating efficiency.

You need such a system, you need *THIS* one, because the attention-getting voice of a Benjamin Signal can be depended upon to saw through any industrial noise; to produce a sound volume that is audible over a large area; and to be ruggedly constructed and especially designed for industrial and commercial service.

Draw on 30 Years' Signal Experience!

Benjamin horns and buzzers have been used for over 30 years in calling, warning, and paging signal systems in thousands of industrial plants. Pitch and volume are right for every use, relays and parts are made to the very highest standards. Let Benjamin Engineers help you obtain greater efficiency, better protection, a reduction in the accident rate, and savings in time and labor, with Benjamin Signals. Write for data!... Benjamin Electric Mfg. Co., **Dept. J, Des Plaines** (Chicago Suburb), Illinois.

Benjamin signals are listed by the Underwriters' Laboratories. They are available for A.C. or D.C. operation, in a wide range of voltages and cycles. Many can be had with choice of Double or Single Projectors.

A feature of Benjamin Vibrating Horns and Buzzers is the ease of servicing due to their unique construction which permits removal of the entire operating mechanism without touching the wiring.

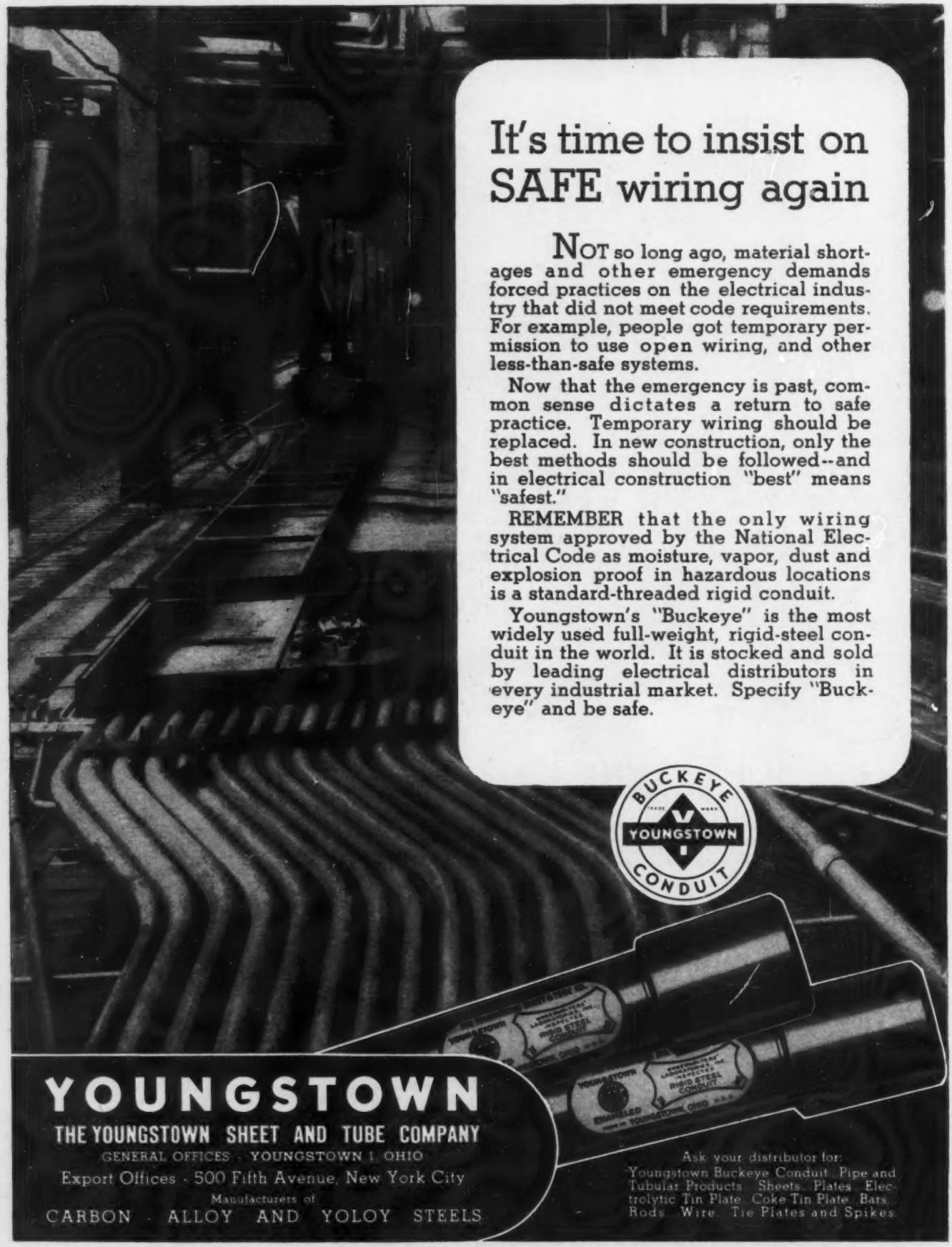
Benjamin Telecode Relays are specially designed for connecting horns to telephone ringer circuits to replace bells in noisy locations where telephone bells can not be heard. For complete data, write for Bulletins.

BENJAMIN

SIGNAL AND ALARM SYSTEMS

Distributed Exclusively Through Electrical Wholesalers

FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*



It's time to insist on SAFE wiring again

NOT so long ago, material shortages and other emergency demands forced practices on the electrical industry that did not meet code requirements. For example, people got temporary permission to use open wiring, and other less-than-safe systems.

Now that the emergency is past, common sense dictates a return to safe practice. Temporary wiring should be replaced. In new construction, only the best methods should be followed--and in electrical construction "best" means "safest."

REMEMBER that the only wiring system approved by the National Electrical Code as moisture, vapor, dust and explosion proof in hazardous locations is a standard-threaded rigid conduit.

Youngstown's "Buckeye" is the most widely used full-weight, rigid-steel conduit in the world. It is stocked and sold by leading electrical distributors in every industrial market. Specify "Buckeye" and be safe.

BUCKEYE YOUNGSTOWN CONDUIT

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

GENERAL OFFICES - YOUNGSTOWN 1, OHIO

Export Offices - 500 Fifth Avenue, New York City

Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

Ask your distributor for:
Youngstown Buckeye Conduit, Pipe and Tubular Products, Sheets, Plates, Electrolytic Tin Plate, Coke Tin Plate, Bars, Rods, Wire, Tie Plates and Spikes.

Cole Electric Co.

1510 So. Los Angeles St. Los Angeles (15), Calif.

PRospect 2068

CLIP END CONTACT

Pressed Copper Shoes
Silver to Silver Contact
Self Aligning
Short Current Path
Individual Stainless Steel Springs
Terminals 1¾" Drilling

HINGE END CONTACT

Silver to Silver
Pressure maintained by Individual Spring Washers
Terminals 1¾" Drilling

BLADES

Hard Drawn Copper Channel
Bearing Yoke at Hinge End
Large Pull-Out ring
Leverage pryout

BLADES STOPS

Standard Equipment

BLADE LOCKS

Standard Equipment

BASES

Hot Dip Galvanized
Drilled to specification

RATINGS

400 to 6000 Amperes
7500 to 161,000 Volts

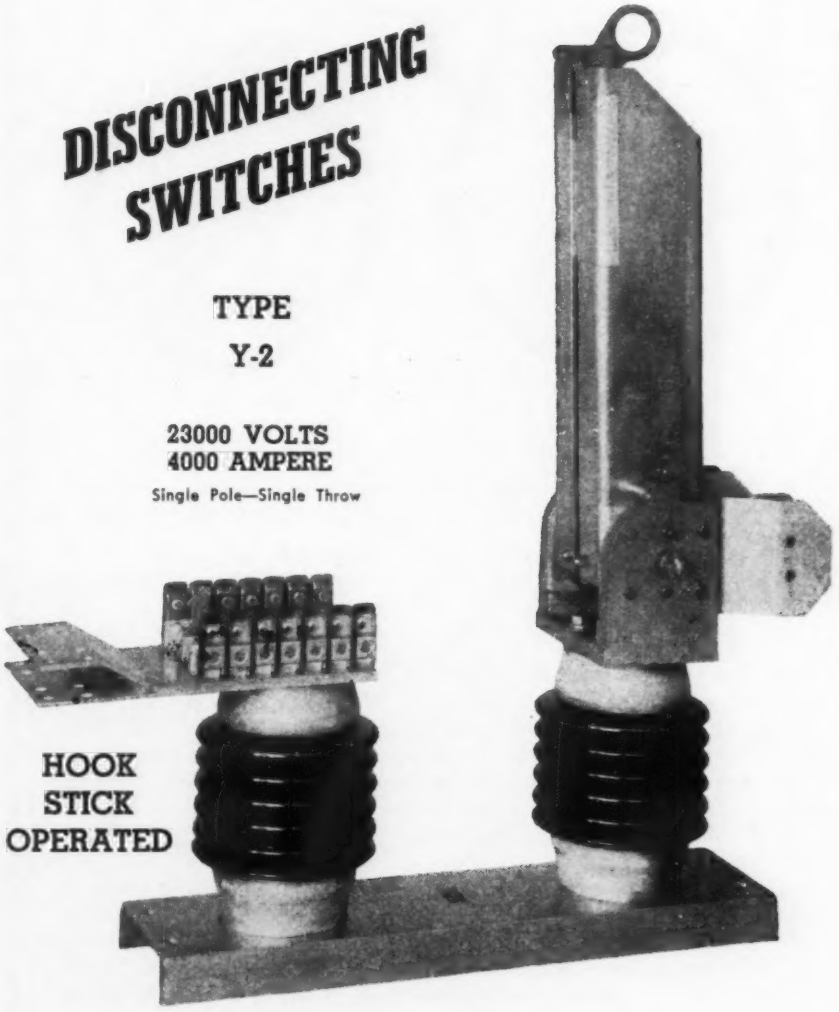
DISCONNECTING SWITCHES

TYPE

Y-2

23000 VOLTS
4000 AMPERE

Single Pole—Single Throw



HOOK STICK OPERATED

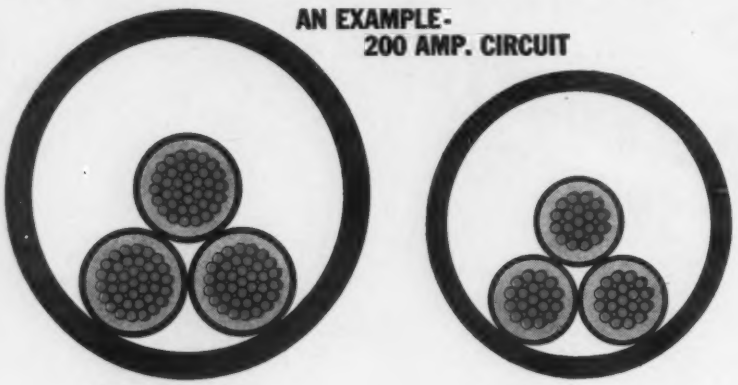
Power Plant Equipment

AIR BREAK SWITCHES MANUALLY OPERATED
AIR BREAK SWITCHES MOTOR OPERATED
DISCONNECTING SWITCHES
BUS AND CABLE FITTINGS
BUS AND CABLE SUPPORTS
FUSE MOUNTINGS, FUSES
SWITCHBOARDS

CRESCENT
ENDURITE
Type RH

Gives Greater Current Carrying Capacity per Dollar of Installed Cost

AN EXAMPLE-
200 AMP. CIRCUIT



250,000 CM

TYPE R

Requires 2½" Conduit. Maximum permissible operating temperature 60° C.

For 100 ft. run cost for wire and conduit—approximately

$159.00

3/0

TYPE RH

Requires 2" Conduit. Maximum permissible operating temperature 75° C.

For 100 ft. run cost for wire and conduit—approximately

$116.00

Both figures are based on 330 feet of cable and 100 feet of galvanized steel conduit at PRESENT LIST PRICES. Saving shown—27%.

The superior heat resistant characteristics of CRESCENT ENDURITE INSULATION with its higher permissible operating temperature and therefore greater current-carrying capacity, permits the use of a smaller size of conductor, and in most cases smaller size of conduit at less cost than would be required for Type R Wire for the same load.

For light loads requiring small sized conductors, Voltage Drop is the determining factor in choice of wire size. Usually in sizes No. 6 AWG and heavier for power circuits or No. 1 AWG and heavier for lighting circuits, CRESCENT ENDURITE Type RH Wire & Cable gives the lowest installed cost-per-ampere of useful circuit capacity.

CRESCENT WIRE & CABLE

NEMA

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

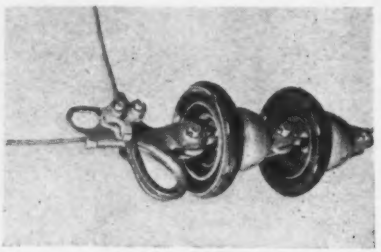
RAY MURPHY CO., 720 E. 2nd St., Los Angeles, Calif.
ELECTRIC AGENCIES, Suite 619-620 Mutual Life Bldg.
605 First Ave., Seattle 4, Wash.

PRODUCTS

that are news

Strain Clamp (100)

Brewer Titchener's special strain clamp for ACSR conductors (No. 2107) is claimed to eliminate need for armor tape by use of an aluminum liner for body and keeper. This clamp is of the snail-shell snubbing type; has a one-piece body pressed from 5/32-in. steel. The metal around the connecting pin is extruded to increase the bearing surface on the pin. Keepers are of



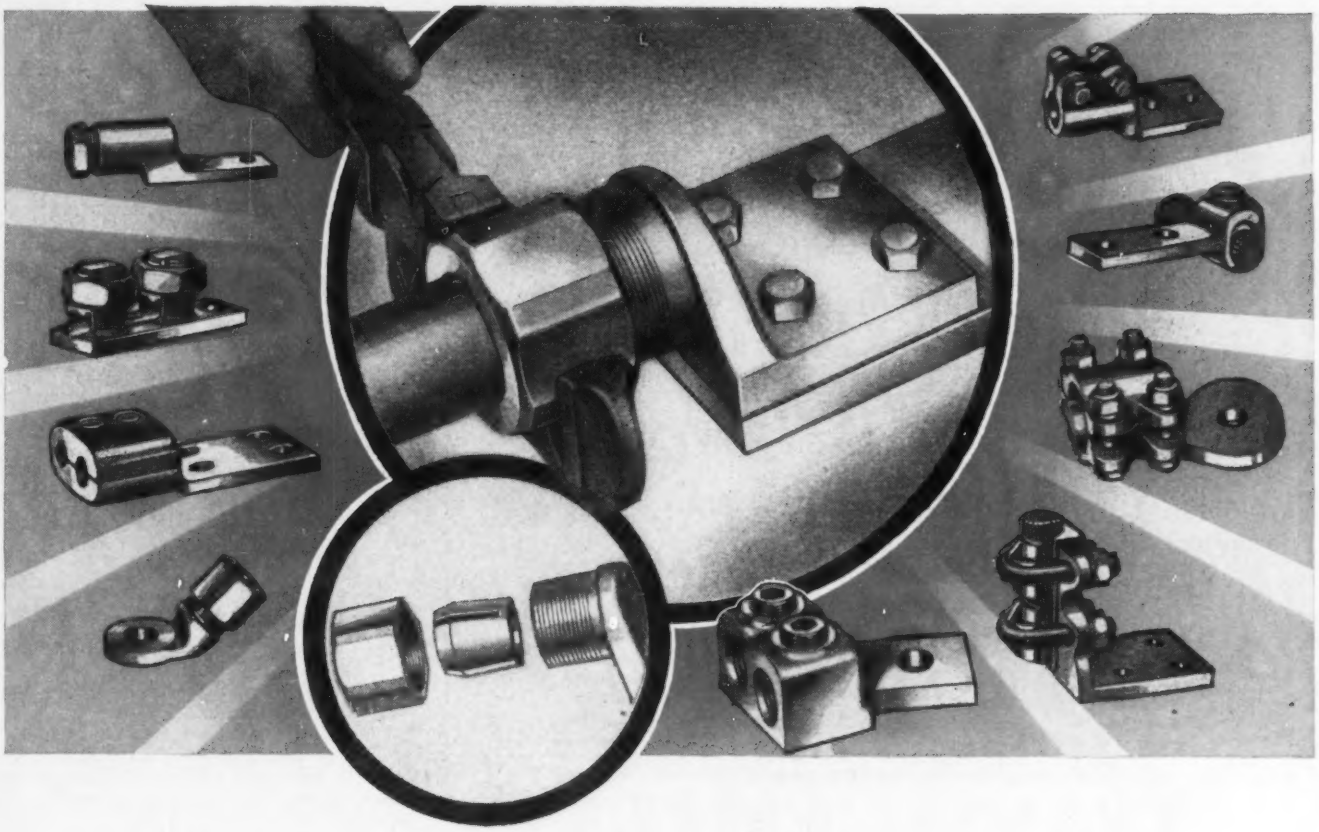
forged steel with double-wave grip. Construction is said to prevent conductor damage and minimize effects of conductor vibration. A come-along loop is provided, and installation requires removal of one clamping bolt and use of one wrench. The clamp is for use only on ACSR conductors within the size range of 0.158 to 0.398 in.

Chart Viewer (101)

A new G-E lightweight chart viewer is available in two models: one for use with 4⅜-in. record rolls as used with G-E Type CD recorders and CE photoelectric recorders and one for 4-in. rolls used with Type CF inkless recorders.

Switch (102)

Trumbull Electric Mfg. Co.'s recently announced Type D enclosed safety switch is rated at 30 amp. and is contained in a box measuring 4½x6⅛x3¼ in. The device is front operated; is so designed that the pivoting lever may be padlocked in the off position to prevent opening of switch or cover by an unauthorized person. Other features claimed are plenty of wiring room and easy-to-get-at terminals. Type D is available in 2 pole, 125 volts; 3 pole solid neutral, 125/250 volts; 3 pole solid neutral with meter twistout, 125/250 volts; 3 pole solid neutral, 125/250, 230 volts a-c.



You always find the EXACTLY RIGHT TERMINAL — in the Complete line

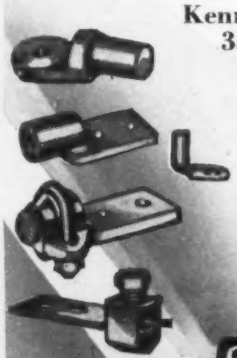
Shown above, at center, is one of the various Multi-Slit Tapered Sleeve lugs in the Penn-Union catalog. You'll also find E-Z lugs with Post-and-Nut, Vi-tite, Multifit, and numerous clamp types. These pictures can merely suggest the variety.

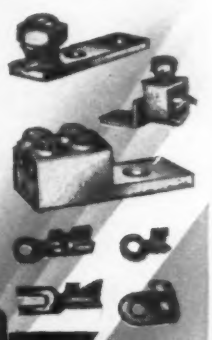
Below are shown Thread-On, Shrink-Fit and screw types, soldering lugs, a wide selection of sheet metal terminals, etc. *Penn-Union makes the terminal you need.*

Also, Tee Connectors; Cable Taps; Straight, Parallel, Elbow and Cross Connectors; Bus Supports, Clamps, Spacers; Grounding Clamps; Service Connectors, etc.

Penn-Union fittings are the choice of leading users, who have found that *if Penn-Union made it, it's dependable*—mechanically and electrically.

Kenneth Anderson Co.	Northwestern Agencies	F. M. Nicholas Co.
334 East 4th St.	2411 First Ave.	1123 Harrison St.
Los Angeles	Seattle, Washington	San Francisco





PENN-UNION ELECTRIC CORP.

ERIE, PA.

The Complete Line of Conductor Fittings

PENN-UNION

Now Ready

New, descriptive

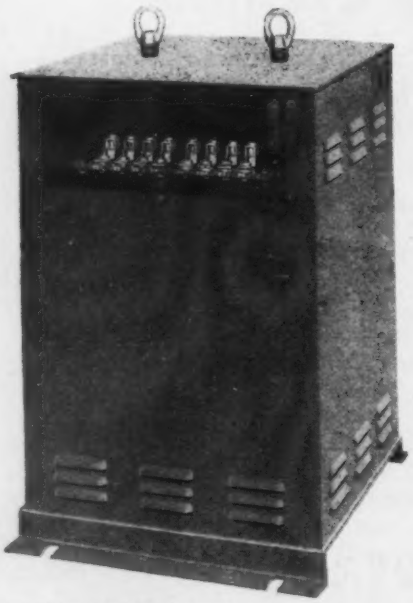
Bulletin No. 1246

Write for it

Illustrating the latest and most complete line of

SORGEL AIR-COOLED TRANSFORMERS

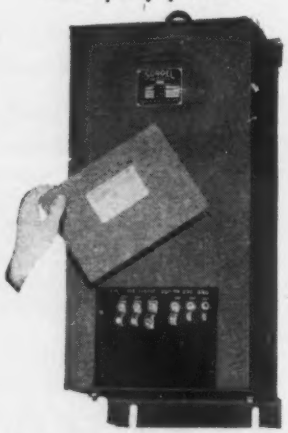
A size and type for every purpose



50 KVA. Single phase. Floor Mounting Type. With cover of connection compartment removed, showing solderless terminals.

1/4 KVA to 1000 KVA. All voltages.

Single phase and poly-phase.



15 KVA. 3-phase Wall Mounting Type Showing connection Compartment with solderless terminals

REPRESENTATIVES

FRED W. CARLSON
307 Wall, Seattle, Wash.
Portland, Oregon

CAMPBELL & GEORGE CO.
379 Brannan St., San Francisco

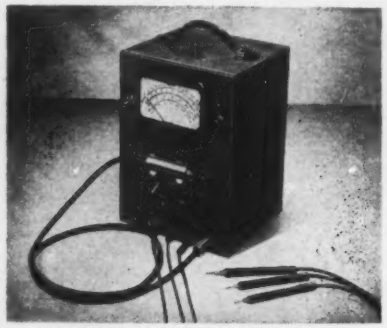
H. D. EASTERBROOK
1262 S. Boyle
Los Angeles 13, Calif.

SORGEL ELECTRIC CO., 844 W. National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled Transformers

Test Instrument (103)

A new electronic test instrument for measuring a wide range of voltage, current and resistance values in home radio receivers, FM and television sets and in many types of industrial electronic apparatus has been announced by Sylvania Electric Products. This instrument, the Type 134 Polymeter, was designed for frequencies up to 300 mc. and permits repairmen to quickly isolate condensers, coils and resistors when faults occur and check circuit operation after replacements are made. A thumb-size



probe utilizing the Type 1247 proximity fuse type tube is provided.

Other features listed by the manufacturer are: balanced amplifier circuit practically independent of line voltage and normal amplifier tube changes; preset factory adjustments permitting correct zero setting for all ranges through one front panel adjustment; convenient range switch for correct multiplier values; five jacks for plug-in test-lead readings of a-c and d-c volts; ohms; amperes and milliamperes.

The instrument is 10 in. high, 18 in. wide and 6⅞ in. deep; weighs 16 lb.; is rated at 30 watts input at 105-125 volts, 50-60 cycles a-c.

Capacitor Analyzer (104)

Specially designed for the radio and electric service industry, a small, lightweight capacitor analyzer has been put into production by Solar Mfg. Corp. This new Model CBB is patterned on the company's Model CB, with improved components for use in humid climates, and an extended capacitance range to measure capacitors from 10 mmf. to 800 mf. A "magic eye" tube is used for Wien bridge balance indication and simplified neon lamp test circuits are used for visual checks of the insulation resistance of electrostatic capacitors and the leakage current of electrolytic capacitors. The instrument may be used also as a line frequency resistance bridge covering a range of 50 ohms to 2 megohms.

Electronic Control (105)

Combustion Control Corp. is offering an electronic control which protects oil burning equipment against flame failure and dangerously low boiler water level. When flame fails, the control cuts off the fuel or sounds an alarm; in the case of low boiler water level, the control operates when water falls below a safety probe. This control is designated as Fireye F18TS, consists of a phototube and amplifying system housed in an aluminum case. It is mounted on the furnace wall and aligned to permit the photoelectric cell to observe the flame through a 2-in. pipe connection, which serves as a sighting tube and a support for the equipment. It operates on 115 or 230 volts, 50-60 cycles, a-c.

"MILLIONS IN USE THROUGHOUT THE WORLD"

BLACKBURN Hi-Strength CONNECTORS

CUT YOUR MAINTENANCE COST!

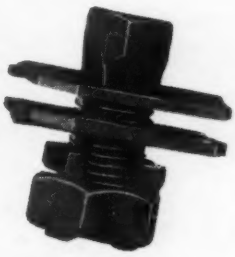
BLACKBURN Hi-Strength CONNECTORS are strong, durable and lasting. In fact, they're the most durable connectors you can buy! That's because they're made of DURONZE, which is stronger than commercial bronze and 75% stronger than hard copper. Once installed, BLACKBURN CONNECTORS are there to stay . . . indefinitely.

All Eleven Offices and Warehouses of the
GENERAL ELECTRIC SUPPLY CORPORATION
can help you cut costs with
BLACKBURN CONNECTORS

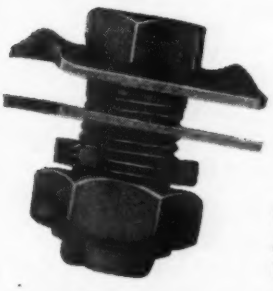
DISTRIBUTORS ON THE PACIFIC COAST

SPLIT-BOLT TYPE
(2-Piece)
Made of DURONZE. For COPPER and COPPER-WELD Wires.

"GRIPITS"
Made of DURONZE SERVICE ENTRANCE CONNECTORS. For COPPER Wires.



SPLIT-BOLT TYPE
With 2 Grooved True Bi-Metallic Washers
Made of DURONZE. For SOLID ALUMINUM to COPPER Wires.



SPLIT-BOLT TYPE
Aluminum to Aluminum
Made of HI-STRENGTH ALUMINUM ALLOY. For ACSR to ALUMINUM or COPPER Wires.

SPLIT-BOLT TYPE
Armor Rod Connectors
Made of HI-STRENGTH ALUMINUM ALLOY. For ARMOR ROD to ALUMINUM, STEEL, or COPPER TAPS.

GENERAL ELECTRIC
SUPPLY CORPORATION
SAN FRANCISCO • OAKLAND • SACRAMENTO • FRESNO • LOS ANGELES
SAN DIEGO • PHOENIX • SEATTLE • PORTLAND • TACOMA • SPOKANE

Never Before!

THERE'S NEVER BEEN A RENEWABLE FUSE LIKE THE

NEW ROYAL-NOARK

NEVER before a renewable fuse so simply constructed...
NEVER before a renewable fuse so easy to renew.....
...so easy to assemble

YOU'RE ALWAYS RIGHT... YOU CAN'T ASSEMBLE IT WRONG!

WRITE FOR DETAILED CATALOG

ROYAL

Quality WIRE • CORD SETS
CARTRIDGE and PLUG FUSES • FUSTATS
TROUBLE LIGHTS • CHRISTMAS LIGHTING SETS

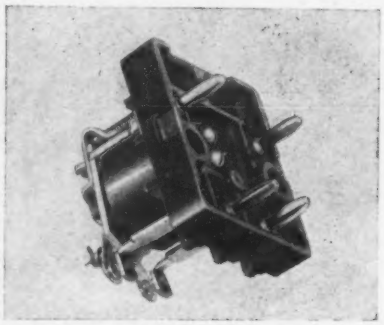
ROYAL ELECTRIC CO., Inc., PAWTUCKET, R. I.

REPRESENTED BY: NORTHWESTERN AGENCIES, INC., SEATTLE, WASHINGTON
ECKERT-LLOYD CORP., SAN FRANCISCO & LOS ANGELES

Control Clock (106)

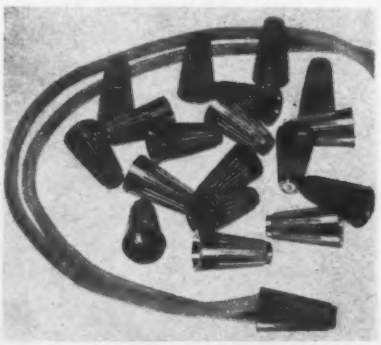
Tork Clock Co. has announced an astronomic dial model which will turn on lights or other electrical equipment at sunset and turn them off at sunrise throughout the year without attention. The manufacturer claims extreme accuracy for the device and states that it may be set to operate exactly at sunset and sunrise or up to 40 minutes before or after. Provision is made also for equipment to be turned off, if desired, anywhere between 11 p.m. and 1 a.m. The dial is equipped with a calendar wheel showing the month and day as well as exactly when the switch will operate. Models equipped with astronomic dials operate on standard time and are set for the exact time correction for the locality in which used. All standard 24-hour Tork clock models may be equipped at the factory with the new dial, the manufacturer states.

Magnetic Relays (107)



Ward Leonard Bulletin 106 midget magnetic relays are designed for application where remote or automatic operation is required and are available for 2- or 3-wire instrument control. Suitable for a-c and d-c on standard voltages and frequencies up to 125 volts, they come with single- or double-pole and single- or double-throw silver contacts. Single break contact ratings for standard relays are 4 amp., 125 volts, a-c, 60 cycles on non-inductive loads. These relays are of the open type mounted on a phenolic insulating base; where enclosures are required, bakelite or steel covers, watertight boxes, etc., may be supplied.

Connectors (108)



Solar Electric Corp. is making a new line of hot-molded bakelite, solderless wire connectors in sizes for various combinations of 10- to 18-gage solid or stranded wires. According to the manufacturer, these connectors are not affected by heat, cold or humidity and may be used for permanent connections or roughing in work without use of tape, solder or flame. They are distributed under the trade name "Scru-it."

"you can get VARNISHED INSULATING PAPERS *of every type — at* IRVINGTON"

Standard Irvington Varnished Papers

- Condenser Tissue
- Kraft Paper
- Bond Paper
- Red Rope Paper
- Saturated Kraft
- Asbestos Paper

When the "spec" reads *varnished paper insulation*, investigate the properties of Irvington's products. Many thicknesses of six varnished papers — made standard by general use — are available.

Base papers are carefully selected for low acidity, uniformity in thickness, tensile strength, and tear resistance. To these base stocks are applied Irvington-formulated insulating varnishes which provide high dielectric strength as well as resistance to heat, oil, and moisture. The varnish film is smooth and free from pin holes.

Write for generous test samples of the Irvington varnished insulating papers listed below.

TYPE	COLOR	RANGE OF THICKNESSES
Condenser tissue	Yellow	.00075" to .002"
Kraft paper	Yellow & Black	.00125" to .020"
Bond paper	Yellow	.0015" to .006"
Red Rope paper	Yellow	.007" to .015"
Saturated Kraft	Yellow	.004" to .005"
Asbestos paper	Yellow	.010" to .032"

IRVINGTON
Varnish & Insulator Company
IRVINGTON 11, N. J.

FOR GREATER DOLLAR VALUE

LOOK to ANHYDROPRENE Cables

1. The tinned copper conductors of Anhydroprene cables may be either solid or stranded.
2. Anhydrex, the lowest water-absorptive of any wire and cable insulation, effectively prevents the troubles caused by the presence of water around cable operations. It has good aging properties and a high dielectric strength.
3. A thin jacket of Neoprene eliminates the need for outer braids or tapes and makes Anhydroprene ideal for use in ducts or wherever other cables become ineffective due to fungus growth, mildew, or rot. Excels in its resistance to sunlight, oils, and flame.

DO THE HIGH costs of materials and labor that exist today make you hesitant about buying the power cables you need? Why not learn now how Anhydroprene Cables can increase the value of each dollar you spend?

Their simple 1-2-3 construction consists of copper conductors insulated with the famous Simplex-Anhydrex compound, and a protective jacket of Neoprene. This Anhydrex-Neoprene combination assures long life with trouble-free service — the thrifty solution to problems of installation where ordinary cables now demand important dollars for repairs and eventual replacement.

Get acquainted with Anhydroprene today and you will realize greater savings from your future cable investments.

Write for Data Sheet No. 115, an informative bulletin describing Simplex-Anhydroprene Cables.

Simplex-WIRES & CABLES

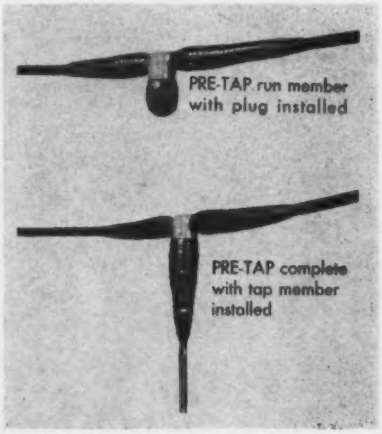
SIMPLEX WIRE & CABLE CO. 79 SIDNEY ST. CAMBRIDGE 39, MASS.

Motor Line (109)

The Westinghouse Life-line motor is a squirrel-cage induction unit claimed to be 35% smaller than earlier models, to have the same electrical properties and to be lighter and more rigid. It is available in drip-proof, splash-proof and fan-cooled construction; has a frame rolled from steel plate; feet and end brackets of heavy pressed steel; all welded construction; self-sealed, prelubricated ball bearings; special synthetic resin-covered wire for coils; dynetrically balanced rotor; interchangeability of parts. It comes in sizes from ½ to 20 hp.; in voltages of 208, 220, 440 and 550; in two and three phase; in frequencies and speeds of 60 cycles, 3,500, 1,750, 1,150 and 865 r.p.m, 50 cycles, 2,920, 1,450, 965 and 720 r.p.m., 25 cycles, 1,450 and 725 r.p.m. and in NEMA standard dimension frames 203 to 326.

Cable Connector (110)

Burndy has announced the Pre-tap Type WT for self-supporting aerial cable. Claimed to eliminate crotch taping, this tap connector consists of two fully insulated parts which can be purchased separately, the run-member and tap-member. The run-member is connected when the line is built and placed in predetermined locations. Where the tap is not required immediately, the open end of the run-member is closed by an insulating plug. At any time, even while the line is hot, the manufacturer states, the plug can be removed and replaced with the tap. Where the run-member is installed at the very end of an aerail cable run, the same plug is used to seal off the end of the Pre-tap.



Current Transformer (111)

A 1,200-volt indoor current transformer for metering service on three-wire, single-phase indoor circuits has been announced by G-E. Designated as Type JL-6, the new unit is available in primary current ratings 10//10 to 400//400 amp. and has been assigned to a 30-kv. full-wave rating. Spacing between the primary terminals is 1½ in. for all current ratings.

Switch (112)

An electronic switch light which provides a soft glow when lights are off is being manufactured by Universal Microphone Co. Called the Permalite, the unit consists of a small, electronic bulb built into the top of a translucent plastic wall plate. The wall plate is designed for standard single-switch outlets and operates on 110 volts a-c- or d-c.

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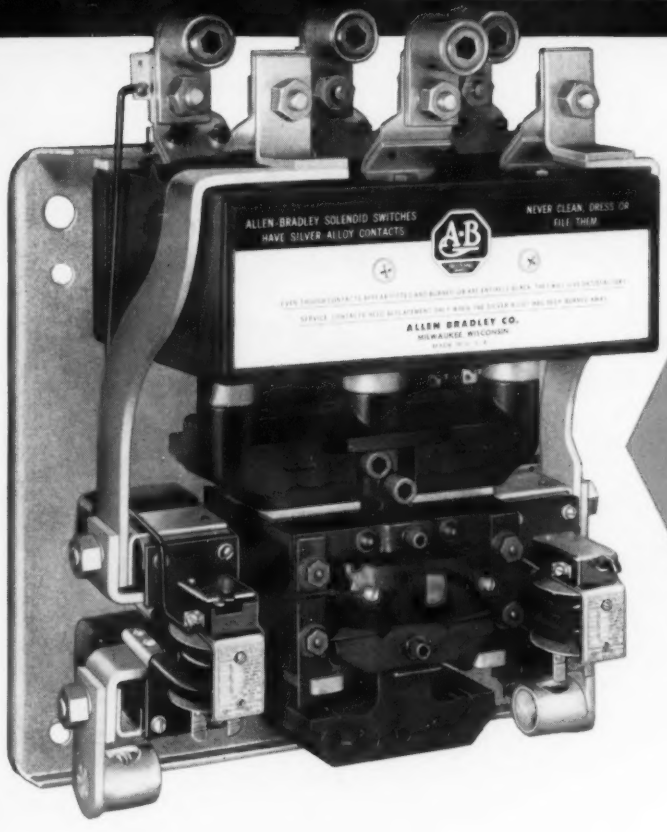
ON TEST. 5,721,098 OPERATIONS *before failure!*



NEW SIZE 5 Bulletin 709 SOLENOID STARTER Shows Amazing Ruggedness in Life Tests

Now . . . Solenoid Construction . . . with all its Advantages . . . in a 300-Ampere Starter

In actual mechanical life test, the new Allen-Bradley Size 5 solenoid starter operated 5,721,098 times before a minor failure occurred. This amazing test proves the inherent ruggedness and long life of this new solenoid starter—a life span heretofore unheard of in a 300-ampere starter!

The New Size 5 solenoid starter has all the proved advantages of Allen-Bradley solenoid design—simple construction . . . maintenance-free, double break, silver alloy contacts . . . compact, self-contained switch mechanism This starter will bring you the same astounding results in a 300-ampere switch as you have been enjoying in Allen-Bradley solenoid starters of smaller capacity. Therefore, for your large motors, specify this new solenoid starter.

Bulletin 709, Size 5 solenoid starter in its attractive, NEMA Type 1, sheet metal enclosure with white interior.

A-B Quality

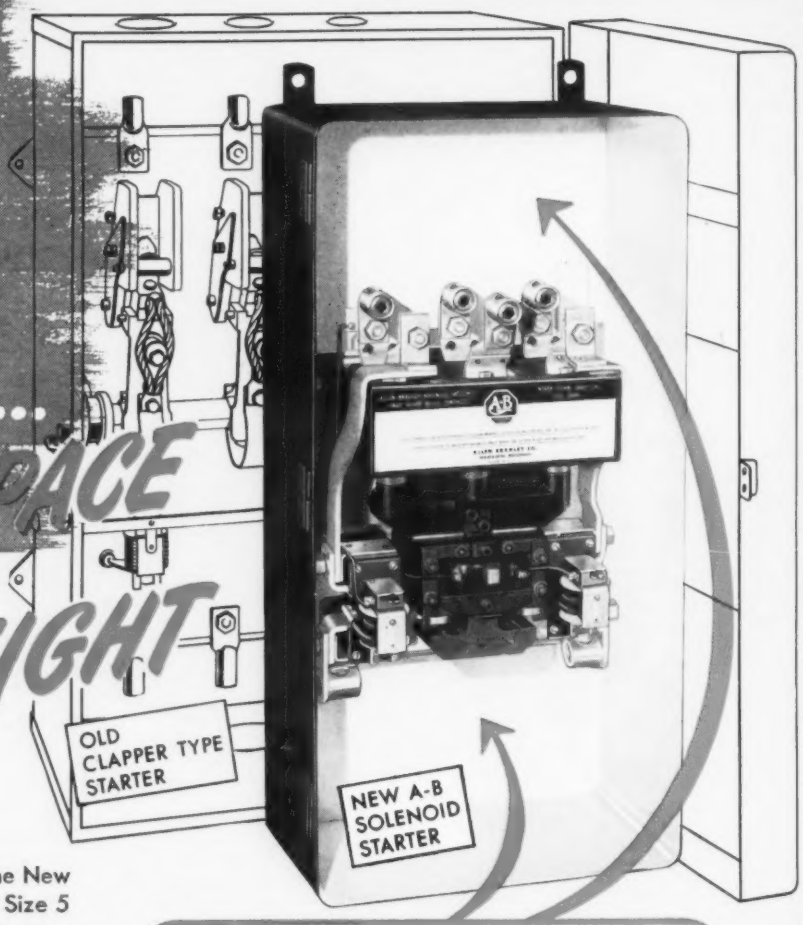
ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY

NEW SIZE 5 Bulletin 709 SOLENOID STARTER takes...

46% LESS SPACE

50% LESS WEIGHT



Put a conventional clapper type starter up against the New Size 5 solenoid starter. Notice the difference! The New Size 5 is much smaller and lighter. Yet it provides much more space for wiring, and will outperform the clapper starter. It is more rugged and reliable . . . has a greater current interrupting capacity . . . is easier to install . . . is practically maintenance-free. Each pole of the New Size 5 solenoid starter is enclosed in an individual arc chamber which confines the arc and prevents flashover. This new unit will easily interrupt ten times its maximum horsepower rating. Following are a few of its other advantages:

UNIT CONSTRUCTION

All parts are assembled on a steel base plate and insulated from it. The starter can be mounted as a unit directly on any metal surface without extra insulation. All terminals are readily accessible from the front.

NO CONTACT MAINTENANCE

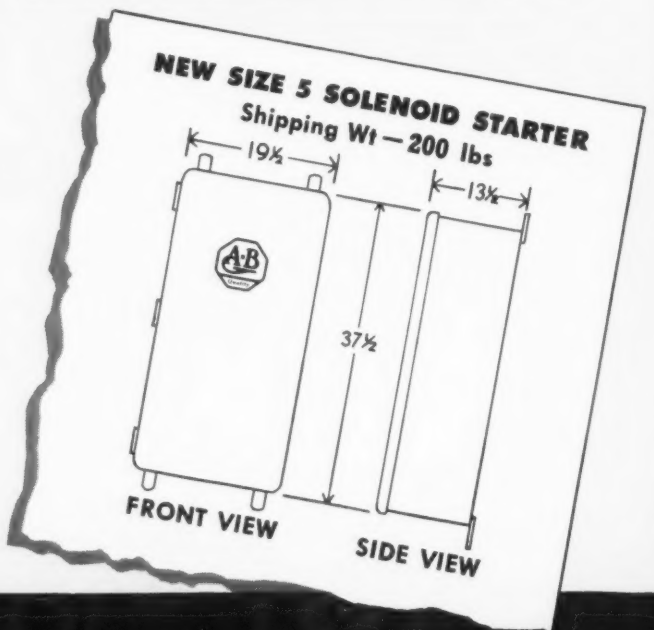
Patented double break, silver alloy contacts are used. Oxides that may form on these contacts are good electrical conductors. Hence, they never require filing or dressing, and valuable contact life is not wasted.

ONLY ONE MOVING PART

The only moving part in this starter is the solenoid plunger which moves up and down in a phosphor bronze guide, practically without friction. There are no pins, pivots, or hinges to corrode or gum up. No flexible jumpers to cause trouble or delay switch action.

Allen-Bradley Company
1316 S. Second St., Milwaukee 4, Wisconsin

LARGER SPACE FOR WIRING, TOO



A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

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BULLETINS

data books, etc.

Welders (113)

Westinghouse a-c transformer type welders are described in a new booklet. Detailed information is given on the 500- and 400-amp. industrial welders for fast, steady production; the 300-amp. welder for heavier-than-average work; and the general-duty welders ranging from 20 to 250 amp. Electrical specifications and performance data are presented in chart form.

Power Plant Operation (114)

For guidance of power plant operators, Allis-Chalmers has prepared a 12-page instruction booklet on water conditioning chemicals and equipment. This booklet touches upon the importance of feedwater control, care of testing equipment, samples, test procedures; carries reference tables to assist in reporting results.

Color in Industry (115)

Information on the scientific use of color in business and industry has been prepared by W. P. Fuller & Co., under the title, "Color Engineering by Fuller." Included are uses of color in increasing work efficiency, bettering employee relations and promoting safety.

Metal Duct (116)

National Electric Products Corp. has revised its Catalog No. 445, describing 4 x 4 Wirewa, enclosed metal duct for housing and protecting electric wires and cables. Photographs and schematic drawings of all component parts of the wireway are included.

Wire and Cable (117)

G-E tells the story of its Flamenol-insulated wire and cable in a 16-page, 4-color bulletin. Steps in the manufacture are described; representative types are pictured and complete ratings and specifications are listed. A companion 2-page bulletin, "Flamenol Mine-Telephone Cable," gives applications and prints results of samples subjected to various reagents over an extended period.

Lampatter (118)

"Glossary of Lampatter," a pocket-sized booklet published by G-E, contains 20 pages of definitions, designations and abbreviations. Term definitions are followed by diagrams of lamp parts; base and bulb designations (illustrated); bulb finish and ordering abbreviations.

Flash Tubes (119)

Data sheets giving electrical specifications, physical dimensions and typical circuit applications of germanium and silicon crystal diodes, hydrogen thyratrons and high-intensity flash tubes are available from Sylvania.

Relays (120)

Signal Engineering & Mfg. Co. has a 4-page bulletin describing its new line of heavy-duty multiple arm relays. Data are given on basic design features, contact ratings, circuit arrangements.

Contact Assembly (121)

Bulletin B-61 of Gibson Electric Co. describes beryllium copper electrical contact springs and contact assemblies. Electrical and mechanical properties are included.

Tachometers (122)

James G. Biddle Co.'s "Frahm" vibrating-reed tachometers are described in Bulletin 1810. This publication contains pictures, diagrams, mounting instructions.

Trucks (123)

Four Wheel Drive's 5-ton trucks are described in an illustrated bulletin released recently by the company.

Maintenance Tools (124)

Motor maintenance tools are described in a 10-page catalog released by Holub Industries.

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Write for Bulletin 106

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ELECTRA'S HUSBAND

Model for an Annual Report

"WHAT are you snickering at?" Electra asked, looking up from the evening paper. "It can't be that radio program because it isn't funny. Or have you finally succeeded in getting your hands on a copy of the *Memoirs of Hecate County?*"

"This isn't a discourse about any county," I answered. "It's a report on a year's operation of the City of San Diego and it's so refreshingly different that it could well serve as a model for the annual report of any big company."

"I don't see the comparison," Electra challenged. "There's no similarity between a corporation and a city."

"Isn't there?" I asked. "Well the business end of this city involves spending eleven and a half million dollars a year in the interests of 362,658 people. And the assets in terms of property are almost a quarter of a billion dollars."

"Oh, all right, but what makes it funny?" Electra asked. "Listen to this," I replied. " 'The character and extent of a nation's democracy can best be determined by examining the government of its cities, for it was in the city that the humane idea of letting the people govern themselves came into being. The roots of our national democracy are nourished by our cities. Democracy will surely die if the governments of our cities ever become impotent.' "

"My sides are splitting," Electra said sarcastically. "Read me some more."

"Okay, here is a highlight on what happens in a city council meeting," I said, continuing to read. " 'Most of the business is of a serious nature, but once in awhile a subject gets hilariously out of hand. In response to many complaints an ordinance was prepared designed to regulate the keeping of chickens. One section of the ordinance would have made it illegal to keep a rooster over the age of three months. At this age, so the experts tell us, they begin to crow. That this is annoying, no citizen who enjoys his sleep can deny. So far, so good. During one of the warm hearings when many a crowing rooster was roasted, an elderly gentleman, who was all for giving the critters the ax, wanted to know how the enforcement agency would determine the age of the rooster since the ordinance didn't require that each have a recorded birth certificate. That just stopped the show. When the ordinance was finally adopted its upper and lower plates had been removed and it did little more than echo the state law already regulating the keeping of fowl.' "

"That's a little better, but I still won't vote it in the same class as the *New Yorker*," Electra commented.

"Give me a chance to prove my point," I countered. "Listen to some of the things it reports under *Police:* 'Three hundred and fifty-eight youngsters in other cities read about our fine climate and came to pay us a visit. They overlooked one little detail. They neglected to get the consent of their parents and the police had to pick them up as runaways. One hundred local youngsters got the itch to travel and took off, leaving mom and dad very sad. Before they had their wheels up an officer reached out and ever so gently halted what might have been a glorious adventure. The youngsters forgot about that modern convenience called 2-way radio which doesn't even give a feller a sporting chance. With 83 cars and 57 motorcycles equipped with receivers or 2-way radio, it's no wonder they didn't get very far.'

"And here is a little thing about false alarms which is in the fire department's report: 'Turning in false alarms still rates high on the practical joker's list. Two hundred and ten of these pranksters, or shall we call them idiots, had a good laugh at the expense of the city. Every time a fire engine rolls out onto the street to answer an alarm, potential death and destruction ride along with it. But the men in the fire department make the best of a bad situation and hold their sides when the judge scowls down on a false alarmer and says, "That little trick will cost you $150." Now just in case you are toying with the idea of yanking an alarm box, we warn you, you'll be caught. How does the department know who turns in the alarm? Well, it's all quite simple, but that's a secret. Persons violating fire laws paid fines totaling $7,155. See what we mean?' "

"The chap who wrote that must be a human fellow," Electra mused.

"He surely is," I said. "Listen to this gem taken from the Social Welfare report: 'Our ordinance also states that the hired help in entertainment establishments are not to mingle with the guests. This piece of legislation is aimed at B-girls who would use their feminine charm to encourage the sale of alcoholic beverages. The investigators frequently find a waitress kissing a customer. The standard reply of the waitress is that the recipient of the osculation is her husband. Whereupon the investigator tells the osculator that if she is not careful she'll be charged with bigamy.'

"A little further along it says, 'Teenage dances, which must be assured adult supervision before given approval, gave the department considerable trouble especially when the chaperones didn't behave as well as the youngsters.' "

"Oh, so there are people like you in San Diego," Electra commented.

"There must be, because the city has one of the finest zoos in America." I said, ignoring her jibe. "Part of the report on the zoo tells about their troubles: 'The most critical need now is fencing material. After 20 years of kicking and nibbling by the animals, much of the restraining influence is gone. Before the war the replacement schedule called for 5,000 feet of new fence each year. During the conflict the most that could be done was to patch and then patch the patch. On occasions a patch on a patch let loose and an animal went for a stroll . . .

" 'Fortunately the animals that enjoyed the short whiff of freedom were of a harmless variety, but not so fortunate for certain citizens was the fact that the animals were generally of the type with long noses, big ears or other odd extremities that exhibited nature's flare for the unusual. Early morning revelers upon seeing these creatures window shopping on the boulevard have been known to swear off for periods as long as a week.'

"The author punctuates the different reports with some really good asides," I continued. "Here is one: 'Firmness is that admirable quality in us that is detestable stubbornness in others.' "

"Now you wouldn't be meaning me, would you?" Electra demanded.

"Oh, no," I said. "I was thinking of the executives who wouldn't agree that this book contains ideas adaptable to an annual report."

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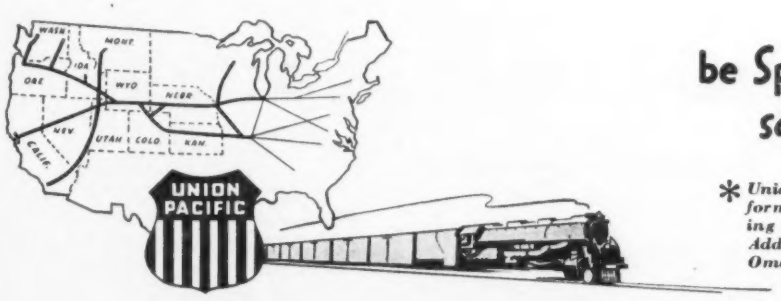

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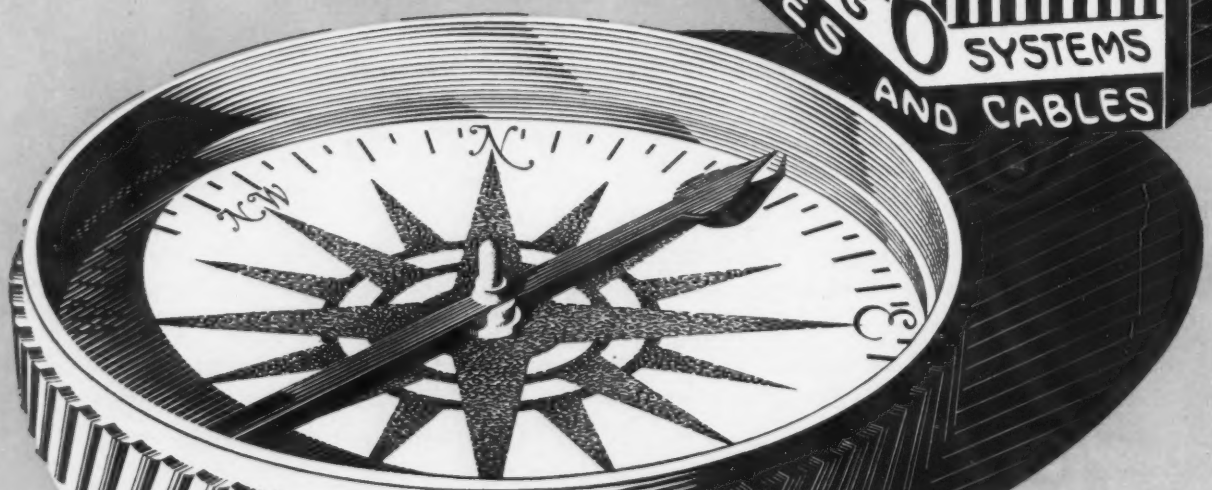

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ELECTRICAL WEST

JANUARY 1947
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WHOSE JOB IS IT TO LEAD?

Ben L. Wells *
Leadership Training Consultant, Los Angeles

IT IS the belief of many people that a personnel manager is the man who does the hiring, keeps employee records, and runs the company picnics. Unfortunately, he was just that until a decade or two ago. Many executives and supervisors, and some personnel managers, still have this limited idea of personnel work.

What, then, is personnel work? *Personnel* means, according to the dictionary, *the people in the company.* Personnel *work*, then, should mean "work with the people in the company," from the president to the newest employee.

What "work" does management want done with "the people in the company?" Inasmuch as net profit is the final objective of every business organization, and it can not survive without net profits, the work that is done with the people in the company should increase net profits.

Net profit is enhanced by loyal and efficient people in the company, whose jobs are well organized to meet their individual objectives, and who do their jobs well and enthusiastically. Net profit is facilitated by employees who reduce waste, improve methods, and pull together for the good of the company.

Every executive and supervisor does personnel work!

Who must do this "personnel work" with the people in the company, which will cause everyone to have high morale, and be enthusiastic about his job and the company? Certainly not the personnel manager alone! An employee of one year's service will seldom spend more than 1/10 of 1% of his time in the personnel office.

Every executive, supervisor, and even other employees must do the things which make everyone in the company eager to do a good job. One employee, resentful toward the company, can reduce the effectiveness of many other employees.

One of the most important factors in the morale and enthusiasm of employees is their relationship with their immediate supervisor. If he is a good leader, they will do a good job for him. If he arouses resentment among his people, they will reduce the effectiveness of his department.

However, the attitude of a supervisor, with a few exceptions, is determined largely by his relationship with his own immediate supervising executive. And so on up the line. The manner in which the president handles the senior executives determines the spirit that is transmitted to intermediate leaders, to junior executives, and through the supervisors to the rank and file employees. Thus, every leader in the company must do personnel work as defined above.

The president of the company, being the one man most interested in net profits, is really the senior personnel executive in the company. The quality of personnel work in a company can be no better than the concept of personnel management held by the president of the company. It is the basic, fundamental function of every leader in a company to handle people in a manner that will make them loyal, enthusiastic and capable workers. And it is also the responsibility of every senior leader to see that every executive and supervisor under his direction is a well-trained and effective leader.

If the executives and supervisors are to do this newly defined personnel work, what then are the functions of the personnel director? He has two major types of responsibilities.

First, he heads a department which recruits, maintains employee records, administers employee benefit plans, sees that legal requirements concerning employees are followed, and directs other activities of a general nature which affect all the employees.

Second, and most important, he should exercise a staff function in that he should influence the other executives in the company, from the president down, in the policies, practices, and methods that will bring about an effective and uniform handling of employees.

This means that the personnel director should be a senior executive, capable of influencing the other executives of the company. Ordinarily a personnel executive should be selected from the existing executive staff. He should then be given the necessary opportunity to acquaint himself with modern personnel practices. In order to make the personnel department very practical, and to have it accepted by other departments, there should be occasional transfers between the personnel departments and other departments.

Importance of Uniformity in Handling People

Why is it so important for employees to be handled uniformly? Why can not each department manager, each supervisor, handle his people as he wants to handle them? That is certainly the way it was done a few decades ago. In those days, an executive or supervisor, in charge of a unit, ran it according to his own mood, without any regard to the manner in which other executives in the company handled their people.

For example, one leader might have been vigorous in obtaining raises for his people. Another executive might have prided himself on how cheaply he could get people to work. It was generally accepted that as long as a leader "got his work out," how he handled his people was his own business.

*Presented at Pacific Coast Electrical Assn. Conference at Fresno, Dec. 5.

The growing independence of the worker, fostered by the power of labor unions, and the mad scramble for employees, has had its effect in changing this individualistic leadership. Employees are no longer docile, hanging on to their jobs year in and year out, and submitting to any kind of leadership because they are afraid of their jobs.

Uniformity in handling employees is important because they are very sensitive to advantages in other departments which they do not have in theirs. They want all the advantages possessed by employees in other departments (and in other companies in the industry) and are not reticent in making their grievances known. In order to eliminate the glaring differences between departments in the handling of personnel, the president of the company should have his departments agree, insofar as is possible, upon uniform policies and practices in the handling of people.

The fact that a company has already established written rules and regulations does not eliminate the extreme differences by which people are treated within the limits of these regulations. The personnel director should ordinarily spearhead this action towards uniformity, and should be an authority on the methods that have proved most effective in the uniform handling of people. This striving for uniformity is a never-ending task, but it pays big dividends in employee morale.

Leaders Must Meet New Conditions

The plan outlined above is a major change from the methods in vogue a generation or less ago. What has brought about the necessity for this change in the basic attitudes and philosophy of management, which hundreds of progressive companies have adopted?

Management is sitting on the hottest seat it ever occupied. We are at the crest of the greatest revolution that has ever taken place. It is the revolution of the working man against the manner in which his leader treats him. This has been going on for thousands of years and has not been entirely bloodless.

It reached its peak in the twelve months following V-J Day in which more than 100,000,000 man-days of labor were lost. *Not only has management lost much of its leadership over its people, but other dynamic and hard working leaders are trying, with some success, to overthrow the whole management structure.* Management must recover this leadership to survive.

Does this mean that management must become an appeaser, giving in to employees on every issue? Such an extreme would also be disastrous. People need good leadership and will accept it. Leaders must study people and develop skill in handling them under present conditions.

What Can Management Do?

If management accepts this responsibility for good leadership, what can an executive or supervisor do about it? In the first place, he can keep himself posted on new and practical developments in the field of leadership. The rewards, as demonstrated by many leaders, are great and are reflected in increased net profit and reduced strain of management.

The first great change in management's attitude followed the disastrous Colorado mine strikes. At this time the Rockefeller interests decided that the managers of their companies must learn how to handle people. Practical studies were made in good companies and in poorly managed companies to determine the principles of leadership. Every executive should be familiar with these principles.*

Since the Colorado mine strikes, a great movement in management education has swept across the country. The principles and practices of leadership are being studied and made available for every leader. This can be done through management conventions, attendance at special sessions of colleges of business administration, reading books, studying trade association literature, and by talking with other executives.

Where Should Training Start?

Who should be trained in leadership? Executives will generally agree that foremen and salesmen should be trained, both in the technical phase of their work, and in getting along with people. That is correct, but it should not stop there. In fact, it should not even start there!

It is not reasonable to expect that foremen will absorb and apply sound leadership principles in handling their workers, if their own leader is not acquainted with and does not use these methods in his relationship with his foremen. *There is nothing that causes so much resentment among foremen as a training program which teaches methods their own leaders do not practice.*

By that line of reasoning, training should start with department heads, managers and superintendents. However, department heads, managers or superintendents are not likely to practice methods in which they have not been trained, if their own immediate directing executives do not practice the same methods. And so it works on up to the president of the company.

Formerly, it would have been most unusual to suggest that the president of the company should be trained in the handling of people. But times have changed. New methods of handling people are necessary and must be learned. Many outstanding leaders have taken training in order to learn these new methods, to be certain they were correct, and to set an example of good leadership which will flow down through the company. In the final analysis, the spirit and attitude in any company can only be a reflection of the attitude of the president. If he does not profit from training, no one else will obtain full value from it.

A Practical Management Training Program

Any training program that will hold the interest and gain the active participation of management must be very practical. We have been asked to describe a program which has been developed to meet this situation, and which has been participated in enthusiastically by several hundred leading executives. The program can best be presented by describing an incident that led to its development.

For several years prior to the war, our organization was mainly concerned with the training of supervisors and salesmen. Methods were developed which obtained enthusiastic participation from most of the participants in trying out new ideas in the handling of people, and in otherwise increasing their productivity. This was done by following through with each person in the training program to encourage him to apply some point from the meeting in his own work. Considerable initiative was developed, which led us into discussions with superintendents and managers about the progress of members of the group.

In one of these progress discussions, a superintendent stated that he was disappointed with the failure of one of his foremen to follow through with the projects he started. He stated that the foreman had lots of practical ideas, and when he did put them into effect, he saved the company large sums of money. The superintendent stated that the strain of this man's failure to follow through was so great that he was about ready to let him go, even though he was the smartest foreman he had.

The training man, working with this superintendent, decided to see if he could find a way to change the foreman's habit, so that he would follow through. If this could be done, the superintendent's strain would be

* A version of these principles will be supplied by the author without cost.

removed, and he would have the benefit of an otherwise excellent foreman.

Not only would the job of the foreman be saved, but he would be given an opportunity to develop the vision and initiative which he had already demonstrated. There is too great a need for leadership to permit a small, easily correctable habit to stand in the way of the development of an intelligent, sincere man. Gone is the day when a leader permits a man to sink or swim without giving him the help he needs. Leaders must learn to give their subordinates the help they need to overcome weakness and to take advantage of their strong points.

Steps in Correcting Poor Work Habits

Step No. 1 in helping this foreman correct his bad work habit was to get him to admit his weakness. If possible, it would be better to do so without a direct accusation. A positive criticism of a fault often causes a man to resist any suggestion for correction. The training man got the foreman to admit the fault by asking, casually, about some of the projects he had started. After it was necessary to state, two or three times, that he had done nothing about his idea, the foreman explained with the statement, "I guess I do not follow through on anything."

Step No. 2 was to get the foreman to admit the consequence of the fault to himself. Here is a great opportunity for executives, who are trying to correct the fault of a subordinate. As a general rule, an executive will point out the consequence of the employee's fault on the *company*. However, the foreman is more interested in *himself* than he is in the company. If the leader shows *how the fault affects the foreman*, the latter is more likely to make the desired change. When the change is made, the company, of course, benefits.

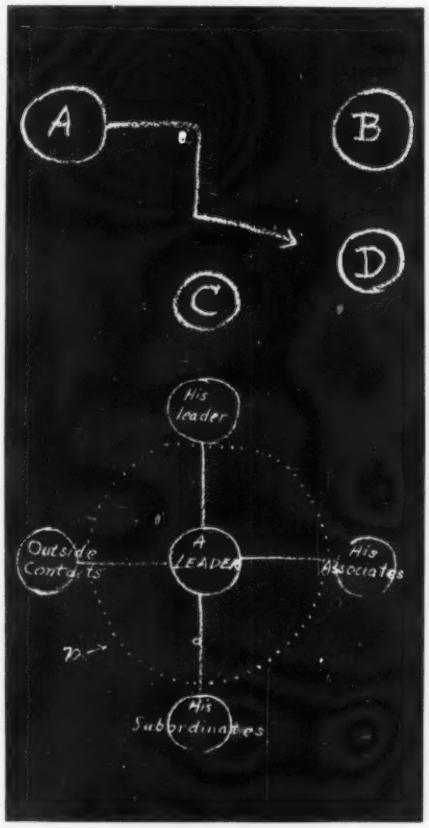
Consequence of Fault to Self

The training man drew a sketch of the manner in which the foreman operated in order to show him the effect of the fault upon himself. He first gave the foreman credit for his vision and initiative. He showed him how, standing at "A" he saw something that should be done at "B." Although he immediately started towards "B," he would see something at "C" which deflected him from "B." Before he reached "C," he was deflected to "D," and so on. The foreman readily admitted that this was a good picture of his working habits. He was not resentful, because he really had not been criticized.

When the training man asked the foreman what would happen to him if he continued to work in this manner, there was only one answer. The foreman had to admit that he would never get anywhere.

Step No. 3 is the solution. Here again is something any executive can start using immediately. In trying to correct the fault of a subordinate, a leader is likely to give the solution without showing the subordinate the need for the solution.

In presenting the solution, two objectives should be reached.



First, the man should be shown that it is a "standard" fault; that others have had and corrected the same difficulty. In this case, the training man told the foreman that everyone who tried to do more than the average had the same difficulty. He forgot what he started to do.

Second, the solution should be easy and should be started Immediately. Before he left the foreman, he had him make a list of his projects in a blank book, including a timetable for completion.

About two months later, the superintendent told the training man that the foreman had corrected his fault. He wanted to know what had been said to the foreman. The training man explained the steps to the superintendent.

Fortunately, the superintendent's reaction was as follows. He said he wanted to learn how to talk to other foremen so that they would improve their work habits. After the training man had shown the superintendent how to correct a fault in a foreman, the latter was so enthusiastic he began to talk to other executives in the company. All of them had the same problem. The manager had several of them.

The training man then began to spend part of his time with executives who wanted to develop their skill in changing the work habits of their subordinates. This was the beginning of a training program for executives. It has been taken by hundreds of executives and supervisors in all types of work. It has included presidents, vice-presidents, department heads, managers, superintendents and foremen. These have been production leaders, sales managers, chief engineers, comptrollers, and professional men, such as lawyers and doctors. It is basic and applies to anyone who wants to increase his skill in handling people.

This problem of "failure to follow through" was just the start. Over a period of years, all the problems a leader has with his subordinates, associates, his own leader, and in his outside contacts were studied. It was found that there are approximately *seventy* basic problems which every leader must meet. These seventy problems were recorded, together with arguments and sketches to be used by the leader in persuading someone else to change a habit.

Methods of Good and Poor Leaders

After these seventy problems were recorded, the actions of several hundred good leaders were studied to see how they handled each of these situations. The uniformity of procedure among the good leaders was remarkable. A study then was made of the action of poor leaders, and again there was remarkable similarity. The methods of the good and poor leaders have been recorded. An especial study has been made of the attitude of subordinates to the various actions of their leaders. It is easily possible to measure the difference in morale, enthusiasm and productivity on employees when they are handled according to the methods of good leaders, as compared to the methods of poor leaders. The day has past when a leader can say that he does not care what his employees think. What the employees think is reflected in their productivity.

In another article, possibly in the March issue, some of the principles of such a program will be discussed, with particular relation to the handling of stubborn people.

As President Sanders of PCEA said at the conclusion of the meeting at which this was presented,

"Aren't we all?"

Overvoltage Tests on Generators

Studies by Southern California Edison Co., as reported to the PCEA, indicate practicability of using 150% overvoltage tests in determining condition of rotating machine windings

J. H. Vivian

SOUTHERN California Edison Co. has for many years followed a rigid schedule of inspection and maintenance of its equipment. Each year the hydro and steam units are completely disassembled and repaired. Principal steps of inspection and routine maintenance are shown in Table I.

It is disconcerting to have a unit fail in service after it has been subjected to such a rigid inspection and overhaul. It is almost certain, however, that if a winding is going to fail, it is going to fail in operation unless something is done during the overhaul period to guarantee safe operation for the ensuing year. What can be done to the stator winding during the overhaul period to secure such a guarantee?

As a first step toward answering this question, Edison engineers developed a complete case history of each winding on the system. It was hoped that from these case histories some inferences could be made concerning the life expectancy of windings.

The histories revealed a surprising number of breakdowns in nearly all of the hydro-generators, but the most detailed study failed to disclose a definite trend of obsolescence.

While the case histories were being built up and analyzed, the technical literature was combed for further information, and correspondence was initiated to obtain the contributions of leading manufacturers.

As to tests which might be made on windings during overhaul to insure against the likelihood of failure in the subsequent period of operation, a great deal of information was turned up. The salient points are as follows:

Westinghouse: "During the past ten years much investigation on the part of the electrical equipment committee of EEI and power companies has failed to correlate any simple non-destructive test with machine breakdown. The best recommendation is that of preventative maintenance. This maintenance, resolved into measurements of insulation resistance or dielectric absorption coupled with visual examination of the winding and proper adjustment of the various parts of the machine, offers the best diagnosis possible of the condition of the machine being studied, providing it is carried out in a well-planned, orderly manner . . . We do not recommend repeated use of high potential voltages as a means of determining quality. The main objection to this is not the intentional damage possibly resulting from such tests, but rather from accidental sources of misapplication, distorted wave shape, inadequate test equipment resulting in higher voltages than desired."

General Electric: "Power factor tests made to date do not give an indication on rotating machine windings as they do on cables and line insulators. Insulation resistance measurements made with a high voltage have been used with some success. For example, if a 13,800-volt a-c machine is tested for insulation resistance at 1,000, 5,000, and 10,000 volts d-c, the insulation resistance decreases as the applied voltage increases. If this test is made periodically, a change in the relative insulation resistances at the different voltages is sometimes observed which indicates a weakness in the insulation . . . Periodic high potential tests of 133% to 150% of normal may be made. This test should be carefully supervised and the testing equipment must be arranged so that no surge voltages (spark-gap arc-over, etc.) and no voltage ripples are impressed on the winding insulation."

Allis-Chalmers: "There are a number of methods of testing the insula-

Case 1

1,750 kva., 2,300 volts
Installed 1912

1926, '33, '36, '41: Failures.
Jan., Aug., Dec., '42: Failures, 400 lb. of punchings replaced.
Apr., '43: Rewound with Class B coils.

Case 2

1,750 kva., 2,300 volts
Installed 1912

1924: Rewound with new coils.
1932-43: 43 coils and 300 lb. of punchings replaced.
Sept., '43: Rewound with Class B coils.

Case 3

28,000 kva., 11,000 volts, 1,470 amp.
Installed 1923

1928: Phase ring support modified.
1935: One top, one bottom armature ring removed.
1942: Insulation burned due to hot finger plates.
Oct., '43: Complete rewind with Class B insulation; non-magnetic finger plates on top only.

Case 4

28,000 kva., 11,000 volts, 1,470 amp.
Installed 1923

1928: 84 new coils, 22 coils repaired.
1933: Coil spacer blocks replaced.
1935: One top, one bottom armature supporting ring removed.
1941: One-third of upper support ring retaped, one group jumper reinsulated.
Dec., '43: Completely rewound Class B; non-magnetic finger plates, top only.

Comments: About 35% of the coils were in very bad condition due to high temperatures of magnetic finger plates on exhaust side of machine; some coils were damaged by loose iron cutting into the mica cell; most coils which failed during hi-pot tests were in this area.

Stator laminations at the top end were burned 1½ in. deep on the exhaust side, ⅞ in. on the opposite side. Iron had to be treated before new coils were installed.

Tests on old winding before removal from slots showed: A-phase, 4 failures at 17 to 23 kv.; B-phase, 4 failures at 20 to 22 kv.; C-phase, 4 failures at 10 to 22 kv.

Case 5

28,000 kva., 11,000 volts, 1,470 amp.
Installed 1923

May, '28: 78 coils replaced.
June, '28: 140 coils replaced.
1935: 5 lap coils replaced and stator laminations repaired at split; one top, one bottom support ring removed.
1942: Completely rewound with 82 new coils and 88 repaired coils.
Dec., '45: Rewound with new 4-turn, Class B coils; restacked with new punchings to eliminate split; non-magnetic finger plates top and bottom.

Comments: Prior to removal, old winding failed at 24, 22.5 and 26 kv., for repetitive tests see Table II.

Case 6

17,500 kva., 6,600 volts, 1,530 amp.
Installed 1913

1917: Completely rewound with repaired coils.

tion of a winding, but none definitely indicate nor enable evaluation to the desired degree of its condition . . . It is quite true that successive high voltages or high-voltage tests weaken the weaker spots in the insulation. Therefore, it is undesirable to apply high voltages oftener than absolutely necessary to assure the desired factor of safety.

"In general, most operating companies use d-c insulation resistance and d-c insulation resistance-time characteristics to enable general evaluation of the condition of insulation. A few operating companies, that we know of, subject their generating equipment to an overvoltage test of approximately 20% in excess of generator terminal to terminal voltage once a year. The overvoltage test is applied by special test transformers and is held for a period of 30 to 60 seconds."

The net result of all this was the conclusion that a reliable method of determining the actual life of a winding was not available. Accordingly a program was initiated which would remove from service those windings which, from their past records, appeared to have the least probable remaining life, and which would at the same time lead to the accumulation of data on which a test of the type sought could later be developed.

An analysis, based entirely on the past record, was made to determine: first, which windings could not be depended upon to operate without breakdown, and, second, which windings could not be operated at full load because of excess temperatures and apparent deterioration.

The first group—the undependable windings—were classified as to kva. rating, voltage and cause of break-

Table I—Check List for Rotating Machine Overhaul

Stator Windings

√ Check for loose wedges.
√ Check for broken, damaged or missing wedges.
√ Check end wedges for movement at end of core and all other wedges for position.
√ Check coil ends for distortion.
√ Check security of all lashing and spacers.
√ Check tightness of coil support brackets.
√ Check for loose coils in slots.
√ Check coil ends for cracks in the insulation or for mechanical damage.
√ Check all connections between coils and connections around frame.
√ Measure insulation resistance of winding to ground from the machine terminals.
√ Clean thoroughly where required.
√ Protect finish by revarnishing as needed.

Rotor Windings

√ Check clearance between blowers and coils.
√ Check for movement or shifting of field coils.
√ Check the dirt on winding and take necessary cleaning steps.
√ Inspect strap field coils for condition of turn-to-turn insulation.
√ Check condition of ground insulation and washers or collars.
√ Check connections between coils and to the collector.
√ Check all bolts for any looseness.
√ Measure insulation resistance to ground of field winding, including the collector and apply 500 volts a-c from winding to ground.
√ Check for shorted turns.
√ Refinish with varnish as required.

Table II—Repetitive Voltage Tests

Machine Reported in Case 5

Tests were made after the rotor had been removed but before the windings were stripped from the stator. The line and neutral leads were opened at the generator terminals. Repeated overvoltage tests were applied to the windings to determine the effect of such tests on the dielectric life of the insulation. Tests were made on each phase to the other two phases and ground. All tests were made at 50 cycles.

Procedure consisted of building up the voltage from zero to the desired value for 50 successive tests of 1 min. each. The voltage was decreased to approximately zero between each test and immediately built up again to the test voltage. For the first test in each group, the voltage was raised approximately 2 per cent above the nominal test value in order to preclude any chance of failure during the subsequent tests due to voltage fluctuations.

The insulation resistance was measured by means of a 2,500-volt motor driven megger, and the capacity in m.f. and dissipation factor were measured with a capacitance bridge. These readings were taken at the beginning of each group of tests and after every tenth successive test.

(Continued next page)

1918: Completely rewound with new coils.
1923: 5 coils replaced.
1924: 56 coils replaced with new coils.
May, '45: Rewound with new 4-turn, Class B, end-turn transposed coils.

Comments: After new winding, temperature of coils dropped 11C. below identical full-load conditions for old winding.

Repetitive tests before removal again indicated that 150% overvoltage testing is not injurious. Ten tests on each phase, each 1 min. at 10 kv. were OK. Two phases each failed on first test at 12 kv. One phase withstood ten tests at 12 kv., failed on first 15 kv.

Case 7

250 kva., 11,500 volts
Installed 1904
1930: One coil replaced after lightning.
1931: One coil replaced after lightning.
1940: Three coils replaced after lightning.
1946: Rewound with extra-insulated Class B.

Case 8

Substantially the same as Case 7.

Case 9

300 kva., 11,500 volts
Installed 1901
1933: One coil repaired.
1934: One coil repaired.
Aug., '39: One (same) coil repaired twice.

Case 10

Substantially the same as Case 9.

Case 11

17,500 kva., 11,000 volts, 917 amp.
Installed 1921
1936: Reversed armature star; soldered and reinsulated lap coil joints.
1937: Installed new generator leads.
1945: Rewound with 4-turn, Class B coils.

Comments: Old winding withstood 55 repetitive tests, including 23 kv. test.

Case 12

17,500 kva., 11,000 volts, 917 amp.
Installed 1921
1935: Rewound with 62 new and 64 repaired coils.
1937: Installed new generator leads.
1946: Rewound with 4-turn, Class B coils.

Comments: Old winding withstood 31-kv. test.

Case 13

1,250 kva., 2,300 volts
Installed 1909
1946: New Class B winding installed.

Comments: Old winding replaced because of age and general bad condition.

Case 14

17,500 kv., 6,600 volts, 1,530 amp.
Installed 1921
1923: 3 coils replaced.
1933: 26 coils replaced with new.
1946: Rewound with single-turn, Class B coils.

Comments: Prior to removal old winding failed at 12 kv., 13 kv. and 14.7 kv.

Repetitive tests were discontinued and gradual break-down tests substituted after it was learned that 150% repetitive tests did not injure a winding for safe operation.

Table II—Continued

Test No.	Test Voltage Volts	Applied % of Rated Volts	Exc. Current Amps.	Duration Seconds		Megger Reading Megohms	Capacity to Gr. M. F.	Dissipation Factor %
A Phase								
						5 min.		
1	17,500	152	..			7,000	.158	..
2 to 10	17,250	150	1.1	60				
11 to 20	17,250	150	1.1	60	Each	7,000	.157	4.0
21 to 30	17,250	150	1.1	60	"	7,000	.160	4.5
31 to 40	17,250	150	1.1	60	"	7,000	.161	4.5
41 to 50	17,250	150	1.1	60	"	10,000	.161	4.7
51	20,400	177	1.36	60	"	10,000	.162	5.0
52 to 60	20,150	175	1.34	60				
61 to 70	20,150	175	1.34	60	Each	10,000	.162	5.1
71 to 80	20,150	175	1.34	60	"	10,000	.162	5.1
81 to 90	20,150	175	1.34	60	"	10,000	.163	5.9
91 to 100	20,150	175	1.34	60	"	10,000	.164	5.9
				60	"	7,000	.165	6.1
101	24,150	210	..	6	Failed, instantaneous overload relay opened the oil switch.			
Failure of back coil in slot No. 68 at top finger plate, fourth coil from line. Megger reading showed ground; could get no reading on capacity bridge.								
B Phase								
						5 Min.		
						7,000	.158	5.0
1	17,250	150	1.1	60				
2	20,400	177	1.36	60				
3 to 11	20,150	175	1.33	60	Each	...	.162	5.3
12 to 21	20,150	175	1.33	60	"	...	.163	5.3
22 to 31	20,150	175	1.33	60	"	...	.164	5.5
32 to 41	20,150	175	1.33	60	"	...	.165	6.0
42 to 52	20,150	175	1.34	60	"	7,000	.165	6.0
52	21,650	188	1.49	60				
53 to 61	21,400	186	1.47	60	Each	...	.167	6.5
62 to 71	21,400	186	1.47	60	"	...	.168	6.6
72 to 81	21,400	186	1.47	60	"	...	.168	7.0
82 to 91	21,400	186	1.48	60	"	...	.168	7.0
92 to 101	21,400	186	1.47	60	"	7,000	.169	7.5
	After an interval of one hour.						.168	7.0
102	21,950	191	1.51	60				
103	22,700	197	1.60	60				
104 to 112	22,450	195	1.58	60	Each	7,000	.168	7.5
113 to 121	22,450	195	1.58	60	"	...	.168	9.0
122	22,450	195	1.58	45	"	Failed, instantaneous overload relay opened the oil switch.		
Failure of back coil in slot No. 36 at top finger plate, fourth coil from line. Endeavored to clear the bad coil in Phase A by cutting clear with bolt cutters.						2,500	.168	9.0
123	17,250	150	1.08	20		Failed.		
C Phase								
						..		
						4,000	.158	4.0
1	17,250	150	1.12	60		...	.159	4.0
2	18,300	159	1.20	60		...	.159	4.0
3	19,300	168	1.28	60		...	.159	4.5
4	20,350	177	1.38	60		...	.158	4.5
5	21,400	186	1.47	60		...	.160	4.8
6	22,450	195	1.57	60		...	.161	4.8
7	23,500	205	1.67	60		...	.159	4.8
8	24,600	214	1.78	60		...	.160	5.0
9	25,600	223	1.87	20	Flashed over at coil term.			
Built up to 23,500 volts before flashover. After trying to insulate at point of flashover, built up to 25,600 volts and held for 20 sec. before flashover.								
Built up again to 25,600 volts, flashover in 5 sec.								
Made repeated tests at lower voltage.								
10 to 49	22,450	195	1.57	60	Each	Not taken		
50	24,000	209	1.74	60		Not taken		
51	24,000	209	1.74	30		Flashed from puncture in insulation to finger plate		
52	24,000	209	1.74			Flashed from puncture in insulation to finger plate		
Back coil in slot No. 108 about 3 in. above the iron. Puncture in insulation apparently occurred during the flashover in test No. 9 above. Probably the puncture was due to an impulse caused by the flashover.								

down, and were scheduled as the first to be rewound.

It was agreed to make overvoltage repetitive tests on these old windings before removal, in order to establish a safe overvoltage for the testing of other windings during overhaul.

As to rewinding, several decisions requiring detailed study must be made before the windings can be ordered. A few are: class of insulation; multi-turn vs. single-turn; higher copper rating vs. insulation gradient; type of wedges; old magnetic fingerplates vs. non-magnetic (in a vertical machine, this change often involves complete restacking of iron); old iron vs. new (to obtain lower losses and better electrical characteristics), and low-loss transposed windings vs. standard.

A great deal of experience has been accumulated since inauguration of the rewinding and testing program in 1943. Some of this is set forth in the case histories and in Table II.

Experience to date indicates that a 150% voltage test of stator windings is valuable and safe.

As the data are examined, it may appear that one or two windings have been replaced without conclusive evidence that they had reached the end of their usefulness. While this *may* be true, it is not necessarily true. The case histories, as presented, omit considerable detail and do not take into account many doubtful items, some of which cannot be seen or measured.

A few factors which have cast doubt on the reliability of a winding, even though the winding has successfully undergone a 150% voltage test are: oil-soaked insulation; broken tie-cords which would require removal of a brittle winding before repair could be effected; loose wedges; worn insulation; cracked mica; extreme corona damage; temperature such as to cause baked coils at rated load, and evidence of metal termites.

As a continuation of the program begun in 1943, a schedule has been completed whereby—over an extended period of years—every generator winding on the system will be replaced.

After the machines with bad case histories have been rewound, all Class A windings with 20 years or more service will be replaced.

Results of the overvoltage tests have been so reassuring as to lead to the ordering of new test equipment so that all rotating equipment on the system can be tested at 150% of line voltage at each yearly overhaul.

Along with this, case histories are being kept current in order to build up a foundation of authentic data. Studies are being continued as to most suitable windings, best insulations, and most desirable protection, such as lifting generator neutrals.

Preventive Maintenance in Electronic Units

Last of three articles on maintaining electronic equipment—conditions of use are discussed to show how they can be altered to save trouble and expense later on—conditions may vary greatly, but they can usually be grouped under three headings

John Fiske

Westinghouse Electric Corp., Los Angeles

IN order to standardize a product and thereby cut its cost, an engineer must design it to operate under a theoretical average condition. This is true for electronic equipment, and the possibilities of departure from standard conditions are many. For practical purposes, however, the non-standard conditions which may develop in the application of an electronic machine usually are problems of: (1) temperature, (2) power supply, or (3) mechanics.

Temperature

In most equipment using gaseous glass-envelope tubes, air cooling is provided by natural convection. Therefore grills or louvers provided for ventilation must not be blocked by placing the cabinet against the wall or running pipes or conduits across them. Where large amounts of power are dissipated, it is necessary to use forced-air ventilation. The great volume of air thus forced through the equipment makes filtering necessary. Average city air may contain a teaspoon of dirt for every 3,000 cu. ft. of air. In shop air the amount is greater and since 3,100 cu. ft. of air is forced over a single 892R tube every seven minutes it is seen that the volume of dust blown over the equipment may reach large proportions. These fine particles will deposit forming leakage paths across high-voltage circuits which will in turn result in flashovers.

Moisture in the ventilating air can cause trouble when there are parts within the equipment at a temperature lower than the air stream. This condition exists when both air and water cooling are used. The air stream striking the colder surface of the water-cooled part deposits moisture. Leakage and subsequent flashover occur.

Common shop air impurities are oil mist and welding fumes. The latter forms high-resistance paths between uninsulated parts of the circuit. The particles are so fine that they are difficult to remove by mechanical filters and are best removed by electrical precipitation. Oil mist is detrimental to relays as it tends to carburize and cause pitting of the contacts. It also carries in impurities that deposit with the oil. Though the oil may be an insulator, the impurities are not, and trouble develops in grid and high-voltage circuits because of leakage.

Another atmospheric impurity that must be considered is the possible presence of corrosive gases containing strong oxidizing or reducing agents such as the chlorine, nitrate, or sulphate radicals. Not only do they attack contacts and other exposed metal parts, but also, when in the presence of moisture, form such a good conductor that operation under high voltage becomes difficult or impossible.

To eliminate the deposition of dirt on exposed parts of the circuit and its components, it is necessary either to mechanically filter or electrically precipitate the particles from the atmosphere. Mechanical filters successfully remove particles down to approximately the size of a half micron. Electrical precipitators extend this range to below a hundredth of a micron. This is necessary for the successful removal of finer particles such as are contained in welding fumes. Corrosive gases cannot be mechanically or electrically filtered. The most satisfactory solution for this is a closed ventilating system with a heat exchanger.

Water like air can provide many problems to plague the maintenance man when it becomes contaminated. There are three types of impurities to consider. These are: (1) solids that are carried by the current and would normally settle in still water; (2) un-ionized solutes, and (3) ionized solutes.

Generally, any water supply containing solid matter is too contaminated with ionized solutes to be of much value where it must contact electrical circuits above ground potential. The un-ionized solutes cause little trouble as long as the cooling is carried out in an efficient manner. When, however, the surface to be cooled is allowed to become hot enough to cause the formation of steam bubbles, the solutes precipitate, forming a scale similar to that found in a teakettle. The scale reduces the rate of heat transfer through this particular surface, resulting in an even hotter area. The cumulative action thus formed can easily ruin a tube. The solution in most cases is to increase the rate of water flow to prevent the formation of the bubbles and at the same time check to see if the tube is working within its rating.

The ionized salts create much more of a problem. Pure water is a good insulator (about 9×10^6 ohms/in.^{3}). Through ionization of soluble compounds (generally salts of the alkaline metals) this value may be reduced to as low as a few hundred ohms. This allows leakage paths that may interfere with control circuits. Of greater importance is the harm done to the actual circuit elements in contact with the water since corrosion resulting from chemical action is initiated at that point of the circuit where the current leaves. Where the voltage to ground is d-c, the water should be analyzed (or an analysis secured from the water company). The analysis should at least include a report on total solids, the amount of calcium carbonate and of chloride, nitrate and sulphate ions.

Power Supply

Power supply for electronic equipment must, in addition to meeting the usual requirements, be well regulated and free from occasional transients such as those caused by grounds. Poor regulation may result in poor tube life. Many oxide and thoriated cathodes used in industrial tubes require that regulation be kept within plus or minus 5% for best results. Where periodic loads of short duration but high current value occur, as in resistance welding and some induction heating loads, the voltage drop must be checked, as it is often this drop, and not the temperature rise, which limits the size of the power supply.

For example, an electronically controlled 250-kva. spot welder may draw 2,300 amp. from a single-phase 440-volt supply for 5% of the time and less than 2 amp. for electronic control purposes the remainder of the period. To obtain 5% regulation or better on such a load it is necessary to consider line reactance when the distance from the supply transformer is over 100 ft. and use 1,500 MCM copper instead of

the 700 MCM dictated by heating effects.

When poor regulation cannot be avoided, it is sometimes possible to separate the electronic control circuit from the main power circuit it controls and put the former on a well-regulated supply such as the lighting circuit. This cannot, however, be done when the control and power circuits are dependent on each other for phase or synchronizing relationships.

Mechanical Problems

The ill effects of vibration from external sources are evident by the loosening of joints, fatigue of metal parts with consequent rupture, and by the variation of electrical circuit parameters. The latter may cause to be set up within the circuit electrical oscillations of either the fundamental or harmonic frequency. Good foundations and solid construction overcome most of the trouble on industrial equipment. Where the aparatus is portable or must, because of necessity, be mounted on a vibrating structure, special mountings designed to absorb the offending frequency can be obtained.

It has not been the purpose of this article to discuss such maintenance problems as prolonging tube life, servicing relays, etc., but to point out the less obvious but very important side of maintenance. The servicing of specific equipment should be covered by the instruction book or articles on a definite type of equipment. For those who are interested in the service side of maintenance following reference list is given.

Electronic Maintenance Reference List

Tube Maintenance

Rules For Prolonging Tube Life, ELECTRONICS, April 1943

Gaseous Tubes and How To Treat Them, ELECTRONICS, January 1942

Tube Protection in Electronic Devices, ELECTRICAL WEST, November 1943

Vacuum Tube Reconditioning, ELECTRONICS, January 1941

Equipment Maintenance

If Electronic Devices Give Trouble, FACTORY MANAGEMENT, September 1938

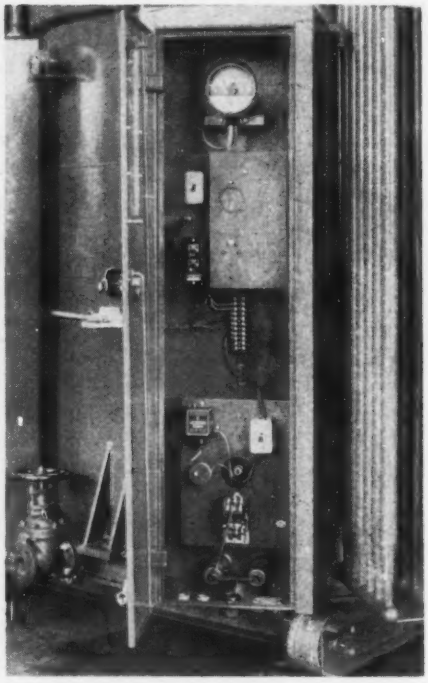
Maintenance of Electronic Controls, CHEMICAL INDUSTRIES, July 1943

Hints on Electrical Maintenance, Section 21, Industrial Electronic Equipment, (Westinghouse Electric Corp.)

Instruments Needed for Electronic Maintenance, ELECTRICAL WEST, September 1946

Finding Your Way in Electronic Circuits, ELECTRICAL WEST, December 1946

Strange place for an electric heater—inserted in a ground-fault neutralizer. The neutralizer is a G-E unit, rated 115 kv., 180 to 90 amp., extended time. It was furnished to the Army at Ft. Peck, Mont., and the heating system is to prevent congealing of the cooling oil when winter temperatures get down to —60°. Two 2.5-kw. Calrod units are supplied at 230 volts and controlled by thermostat set to initiate heating at —31°. When the oil is this cold it has contracted below top connections to cooling fins so heat is not lost by circulation of oil through fins.



Engineering College Notes

University of B. C.

The department of mechanical and electrical engineering at the University of British Columbia is now staffed by eleven full-time instructors and six graduate assistants. Most recent appointment is that of Dr. Frank Noakes, formerly of the University of Toronto, and more recently, engineer with the Research Laboratory of the Hydro-Electric Power Commission of Ontario.

Some 250 huts have been acquired from the Army and converted into drafting rooms, laboratories and lecture rooms. Also, space has been added to the electronics and electrical communications laboratory.

Colorado Utility Uses Radiant Heat

Shown under construction is Public Service Co. of Colorado's South Terminal control building at Denver. Wrought iron pipe is laid in the floor for radiant heating to be used in the basement and ground floor of the one-story building

Aluminum Conductors For Interior Wiring

Fred Benz
U. S. Rubber Co.
San Francisco

No. 14 copper at left has larger outside diameter than No. 12 aluminum with dipped Laytex insulation. Aluminum with fittings, center, and soldered, at right

POSTWAR building, like other postwar enterprises, has run head-on into material shortages. Just as this situation has forced industry at large to look to new materials in order to keep workers busy, production moving and finished products available to the public, so it has forced the building industry to seek a means of by-passing the critical shortage of copper. Hence the introduction of insulated building wires and cables of aluminum.

Aluminum conductor for building wire is permitted by the National Electrical Code. Underwriters' Laboratories recently completed extensive tests on rubber-insulated aluminum wires, with the result that there is now being manufactured in accordance with the Underwriters' standards a complete line of aluminum building wire, paralleling the copper line. Each coil of aluminum wire carries the Underwriters' label. Aluminum may go a long way toward removing one obstacle in the present housing emergency.

Properties of Aluminum

While aluminum as a metal has only about two-thirds the conductivity of copper, another physical property—weight—offsets this factor in two ways. The light weight of aluminum (less than one-third the weight of copper) is in itself an advantage, both in the handling and supporting of electrical structures. Furthermore, light weight has an electrical advantage: the cross-section area of an aluminum conductor can be increased while still keeping the weight per unit length below that of copper. Such an increase enlarges the surface area, which is to say the heat-radiating surface, and thus raises the current-carrying capacity.

These advantages have led to numerous aluminum cable and alumi-

Aluminum Is an Old Story in Power Applications

While for interior wiring, aluminum is new and novel, the industry has had more than 50 years' experience with aluminum as a conductor in numerous other applications. Many of the original installations, some dating back to the late nineties, are still in operation today and giving trouble-free service.

Aluminum buses were used for transmitting electrical power at the Niagara Power Plant in 1895, and aluminum buses in plants where electrolytic cells are in operation are in wide use today. As used by electroplaters, aluminum buses operate under the most severe corrosive conditions. Modern installations of aluminum buses include steel mills, chemical plants, electrochemical plants, storage battery rooms, central stations and substations.

Overhead ACSR (aluminum cable, steel reinforced), first installed in 1909, now totals more than 1,500,000 miles. Pound for pound, aluminum has the highest capacity of the common metals for carrying electricity, and high-grade steel has the highest strength. The two combined in ACSR provide a light, strong cable, especially suited for long-span lines.

In 1909, ACSR cable was installed in Chicago for trolley car operation. The ends of this cable were soldered to copper cables, and five aluminum-to-aluminum connections were made at intermediate points. During 1945, all connections were opened; the joints were examined, and the cable was found to be in perfect condition. Connections were resoldered and the cable is back in operation.

An example of the ability of aluminum conductors to withstand the ravages of salt air and weather is a 5-mi. aluminum cable on an island in Long Island Sound. It was installed in 1899, and is still in service. This cable is "just as good today as when put up" according to the manager of the island's light and power company.

Table I—Rubber-Covered Aluminum Conductor Data

Conductor Size	Stranding No.	Stranding Size	Conductor Diameter (Inch)	Insulation Thickness (Inch)	Overall Diam.* (Inch)	Area* (Sq. Inch)	Weight per 1,000 ft.* (lb.)	Capacity In Conduit (Amp.)	Capacity In Air (Amp.)	Resistance per 1,000 ft. at 25°C. (Ohms)	Standard Length (Feet)	Standard Package
Type RU (160° C)												
12	Solid	.081	.081	.018	.144	.017	12	17	21	2.68	500	Carton
10	Solid	.102	.102	.018	.165	.022	17	25	34	1.68	500	Carton
8	Solid	.128	.128	.025	.208	.034	26	34	46	1.06	500	Carton
6	7	.0612	.184	.025	.290	.066	46	46	67	.680	500	Carton
Type RH (75° C)												
6	7	.0612	.184	4/64	.367	.106	84	55	80	.680	500	Wrapped Coil
4	7	.0772	.232	4/64	.415	.135	110	71	105	.430	500	Wrapped Coil
2	7	.0974	.292	4/64	.475	.177	148	97	143	.269	500	Wrapped Coil
1	19	.0664	.332	5/64	.571	.256	201	109	164	.213	1000	30" Reel
1/0	19	.0745	.373	5/64	.629	.311	235	126	193	.169	1000	30" Reel
2/0	19	.0837	.419	5/64	.675	.358	276	147	223	.134	1000	36" Reel
3/0	19	.0940	.470	5/64	.726	.414	324	168	260	.106	1000	36" Reel
4/0	19	.1055	.528	5/64	.784	.483	384	193	302	.0843	1000	36" Reel
250,000	37	.0822	.575	6/64	.873	.599	457	214	340	.0714	1000	36" Reel
300,000	37	.0900	.630	6/64	.974	.704	531	239	374	.0595	1000	42" Reel
350,000	37	.0973	.681	6/64	.998	.782	597	260	424	.0510	1000	42" Reel
400,000	37	.1040	.728	6/64	1.045	.858	661	281	458	.0446	1000	42" Reel
500,000	37	.1162	.813	6/64	1.130	1.003	786	319	521	.0357	1000	48" Reel
750,000	61	.1109	.998	7/64	1.365	1.463	1119	399	659	.0238	500	42" Reel
1,000,000	61	.1280	1.152	7/64	1.519	1.812	1408	458	785	.0178	500	48" Reel

*Approximate.

num bus installations over the past 50 years (see box).

Now, the introduction of new insulations has expedited the extension of these advantages into the building wiring field.

Size for size, aluminum wire has 84% of the permissible current-carrying capacity of copper wire with the same insulation (see National Electrical Code 1940 edition section 3107, 1947 edition section 3106). Aluminum wire compares with copper wire of the same size and insulation as follows (values for copper equal 100%):

Characteristic	*Aluminum*
Diameter (metal only)	100%
Area	100%
Weight	30%
Conductivity	63%*
Resistance	159%
Current-carrying capacity	84%

* In comparison with commercial copper which in turn equals 97% of International Annealed Copper Standard.

An aluminum wire compares with a copper wire of the same conductivity as follows (values for copper equal 100%):

Characteristic	*Aluminum*
Diameter (metal only)	126%
Area	159%
Weight	49%
Conductivity	100%
Resistance	100%
Current-carrying capacity	112%

The flexibility and tensile strength of aluminum building wire is similar to that of copper. As a result of experience gained with aircraft wires during the war, improvements have been effected in mechanical properties with the result that stretch and elongation when pulling into conduit can be held to 1% or 2%—much less than that of copper.

Table I gives complete information on the new aluminum rubber-insulated conductors.

Available for branch circuits is Type RU (Laytex) aluminum wire in sizes Nos. 6 to 12. Within this range, a given aluminum wire compares with copper wire two sizes smaller, No. 12 Type RU aluminum, for example, compares with No. 14 Type R copper. But while the resistance for such equivalent sizes is the same, the aluminum has a higher current-carrying capacity. Furthermore, although the diameter of the No. 12 aluminum metal wire itself is larger, the over-all diameter is less than that of the No. 14 Type R copper, because of the smaller dimension of the high-grade, dip-process Laytex with which the aluminum is insulated.

This allows the same number of aluminum wires, as of equivalent copper wires, to be run in a given conduit. A given size of conduit will thus carry the same number of wires, and can carry more current, if Type RU aluminum wire is used than if Type R copper were used.

The 1947 Electrical Code's Table 4 may thus be applied to Type RU aluminum wires as shown in Table II.

Available for feeder and power circuits is Type RH (Paracore) aluminum wire and aluminum cable in sizes from No. 6 to 1,000 MCM. The Type RH aluminum conductors compare with the *same* size Type R copper conductors, and have the same current-carrying capacity. This comes about from the fact that, although the aluminum is rated by the code at 84% of the current-carrying capacity of copper with the same insulation, Type RH insulation permits approximately 19% more carrying capacity than type R. As an example, No. 2 Type RH aluminum is rated 97 amp., whereas No. 2 Type R copper is rated 95 amp. Similar relationships apply to all sizes.

Current-carrying capacity of Type RU aluminum may thus be considered the same as Type R copper, size for size. Also, the reactance is the same. But the resistance of the aluminum is higher. Therefore, in the small percentage of cases where length of run or voltage drop becomes a determining factor in design, the following comparison may be useful. With aluminum and copper conductors of the same size carrying the same current, voltage drops in the two will be the same when the length of the aluminum circuit is as follows (length of copper circuit equals 100%):

Conductor Size	*Aluminum Length*
1,000 MCM	90%
500 MCM	80%
No. 4/0	68%
No. 1/0	65%
No. 6 and smaller	64%

Joints, Splices and Terminals

In general, aluminum wire may be handled in the same way as copper. This applies to terminals, to connections of aluminum to aluminum and of aluminum to copper, and to securing solid aluminum wire under the terminal screws of wiring devices.

Compression and indented terminals have been widely used for both large and small conductors in the aircraft industry, where excessive vibration and sudden changes in temperature must be provided for. Manufacturers of these types of terminals include: Thomas & Betts Co., Buchanan Electric Products Co., Burndy Engineering Co., and Aircraft-Marine Products Inc.

In branch circuit wiring, fixture type splicing connectors ("wire nuts") are useful for joining two or more small wires in an outlet box. Several manufacturers of such products are listed by Underwriters' Laboratories. Also listed are many types of terminal connectors, for both large and small conductors.

Table II—Type RU Aluminum Conductors in Conduits

Aluminum Conductor Size	Required conduit size (inches) if number of conductors is: 1	2	3	4	5	6	7	8	9
12	1/2	1/2	1/2	1/2	3/4	3/4	1	1	1
10	1/2	1/2	1/2	3/4	3/4	1	1	1	1 1/4
8	1/2	3/4	3/4	3/4	1	1	1	1 1/4	1 1/4
6	1/2	3/4	3/4	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2

Aluminum has long had the reputation of being something that could not be soldered. This view stems from past attempts to solder aluminum with unsuitable flux. Almost immediately upon contact with air, aluminum becomes coated with a film of oxide. It is, in fact, this film which accounts for aluminum's great durability and resistance to corrosion. Soldering aluminum is simply a matter of using flux which removes this oxide in the same way that other fluxes remove oxides from other metals. Such a flux is available, and its successful use, which is no more complicated than soldering copper, has been thoroughly demonstrated and practiced.

Special flux, standard high-grade solder and the usual tools—torch, alcohol lamp, dip ladle and soldering iron—are all that are required. Working temperature and soldering technique are practically identical with those for copper.

Among the principal manufacturers of aluminum soldering flux are: Aluminum Co. of America, Pittsburgh; Lloyd S. Johnson Co., Chicago; Eutectic Welding Alloys Co., N. Y., and Kester Solder Corp., N. Y.

Phoenix, Arizona—Before and After

Central Avenue, Phoenix's thoroughfare, is now getting good light—1.75 ft.-candles horizontally on the street, or 30% more than IES minimum. Outmoded ornamental uprights were replaced by L-M Controlite Sr. Luminaires, suspended from 6-ft. upsweep brackets on Union Metal Steel Standards. Light centers are 28 ft. 4 in. above the sidewalks. Curblines on which standards are set are 55 ft. apart. Units are opposite, every 135 ft. Lamps are 15,000-lumen. J. E. Redmond Supply Co. drew the plans, Halsey Royden was contractor, New State Electric did the electrical work

What Man Is Made To See

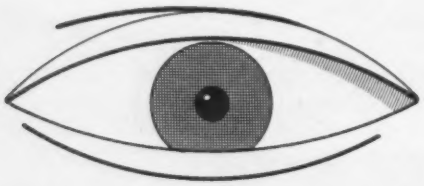
How the luminous environment to which man's eyes are naturally adapted forms the basis for a new approach to interior lighting. A digest of H. L. Logan's IES paper, "Light for Living"

WHAT is man supposed to see? Or, to put it another way, what is the luminous environment which is the natural one for the human eye? And if the human eye can be shown to be adapted to a certain luminous environment, can this be of value in the design of artificial illumination, and if so, how?

These were the questions which H. L. Logan, research manager of the Holophane Co., set out to answer. Recently, in a swift trip through the West, he told lighting men at IES gatherings in several cities, what the answers seem to be.

The answers come principally from a research program begun in 1933. Logan has set forth the results of this research in three IES papers as follows: *Specification Points of Brightness*, 1939, *The Anatomy of Visual Efficiency*, 1941, and *Light for Living*, 1946.

These studies have given rise to a radically new and fundamental approach to lighting design. To what extent this approach may supplant the existing ones is debatable, but it is



certain to influence them. The following explains what "Light for Living" means. It is a digest of the IES paper. Illumination men who find their imaginations stirred will want to turn to the paper itself, where thorough documentation and detailed descriptions of the test procedures will be found.

Man's Home

Starting at bedrock, Logan turns his attention to the human race. He quotes S. F. Markham's *Climate and the Energy of Nations* as follows:

"Man may be the highest product of the animal kingdom, the most intelligent and a superb triumph of evolution, but his control of body temperature is feeble compared to that of many animals. The bat can survive a change in its own body temperature of 60°F or more, while most animals possess some form of temperature control, from the adjustable feathers of birds to the honeycomb of the elephant's ear serving as an air-cooled radiator for the blood. Many animals can suffer a change of ten degrees in their body temperature without inconvenience, but man must keep his body temperature near 98.6°F or die."

Since man is so vulnerable to temperature changes, his origin had to occur where the weather was such that man, as an unclothed, naked animal, could maintain his internal temperature at the safe level. Logan says:

"All available researches on this subject were examined and correlated by Markham who reports that they point to the neighborhood of the 70°F annual isotherm as the probable location of man's original habitat."

The important point in regard to this is that man has been able to move away from this region not because of physiological adaptability, but by means of his inventions. Man is not adapted to the regions he occupies. His houses, clothes and heating techniques enable him to survive there. He is still adapted to his area of origin.

Associated with man's place of origin are, in addition to temperature, very definite ranges of humidity, air pressure, air movement and solar radiation, and these determine the accompanying luminous conditions. These are the luminous conditions to which the human eye is adapted.

Logan points out that man, being still most closely adapted to the climate of his place of origin, tries to recreate that climate wherever he goes. He points out, "The entire history of shelter engineering reveals an unremitting effort by mankind to provide itself with an indoor climate that would reproduce as nearly as possible the climate to which man is best adapted, *i.e., the climate of his place of origin.*"

Man's Eyes

The idea of extending this principle to luminous environment follows naturally, but a precise method of doing it requires an understanding of the functions which the human eye performs.

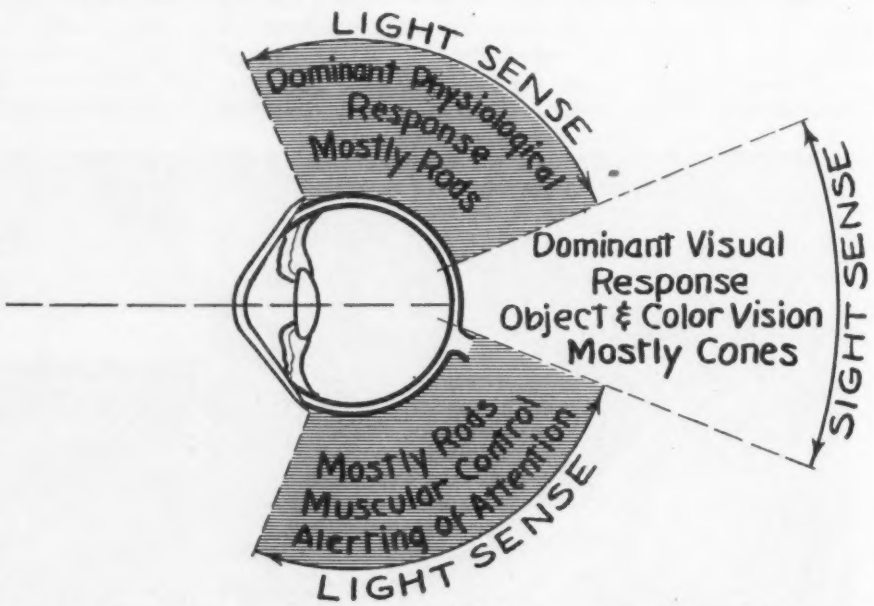

LIGHT SENSE
Dominant Physiological Response Mostly Rods
Dominant Visual Response Object & Color Vision Mostly Cones
SIGHT SENSE
Mostly Rods Muscular Control Alerting of Attention
LIGHT SENSE

Fig. 1—Schematic vertical section through the eye, indicating major divisions

Of all the light entering a human eye, see Fig. 1, a narrow "beam" at the center of the field of view falls upon those light-sensitive eye cells called cones, which analyze it in painstaking detail. The great preponderance of light falls upon a different type of light-sensitive eye cells called rods. These are primarily concerned, not with forming up crystal clear

images, but with sending high-speed messages to the body—messages which alert the individual and prompt muscles to move.

As Logan puts it, "When we have to take time *to think* to act we risk destruction by our environment." He points out that we avoid obstacles in our path, not by looking directly at them, but by sensing them in the outer portions of our field of view. Sensations in this outer field, handled by the eye's rods, are what enable a human to run the daily gauntlet of physical hazards and thus survive.

The Mayo Clinic is on record as stating that the first class of light-sensitive eye cells—the discriminating cones—constitute only 5% of the light-responsive cells of the eye. Logan contends that lighting men have been concentrating on the 5% and largely ignoring the 95%. They have not been giving adequate consideration to the entire field of view.

To simplify his study of the entire field of view, Logan somewhat arbitrarily divided the field into the zones shown in Fig. 2. Then an instrument was devised for measuring the amount of light flux in the field as a whole, and within each zone.

Measuring Luminous Environment

This fluxmeter accepts light radially throughout a 180° field by means of a special mirror which reflects the light to an optical train where it comes to a focus and is accurately transformed from a spherical projection into a plane projection the exact size of a barrier-layer cell to which it is delivered. A set of masks corresponding to the entire field and to each visual zone permits taking any desired measurements in turn.

With this instrument, readings were taken "in central New York State during the period of the 70°F summer isotherm, 1943, and in the Federal District of Mexico during the period of the 70°F spring isotherm, 1944."

"The procedure was to measure the horizontal foot-candles, the mean brightness of the field of view, the flux reaching the cell from the entire field, and then to measure the three upper zones separately. The total field reading was repeated at this point. If it differed from the first reading, the entire process had to be gone through again. If it checked, the three lower zones were then read, and the total reading was repeated at this point. If more than five per cent from the previous checks, the whole series was rejected and a new series begun . . ."

By such procedure, and with a great many other considerations taken into account to make certain that what was being measured was the natural field to which the human eye is adapted, data for *Light for Living* were collected.

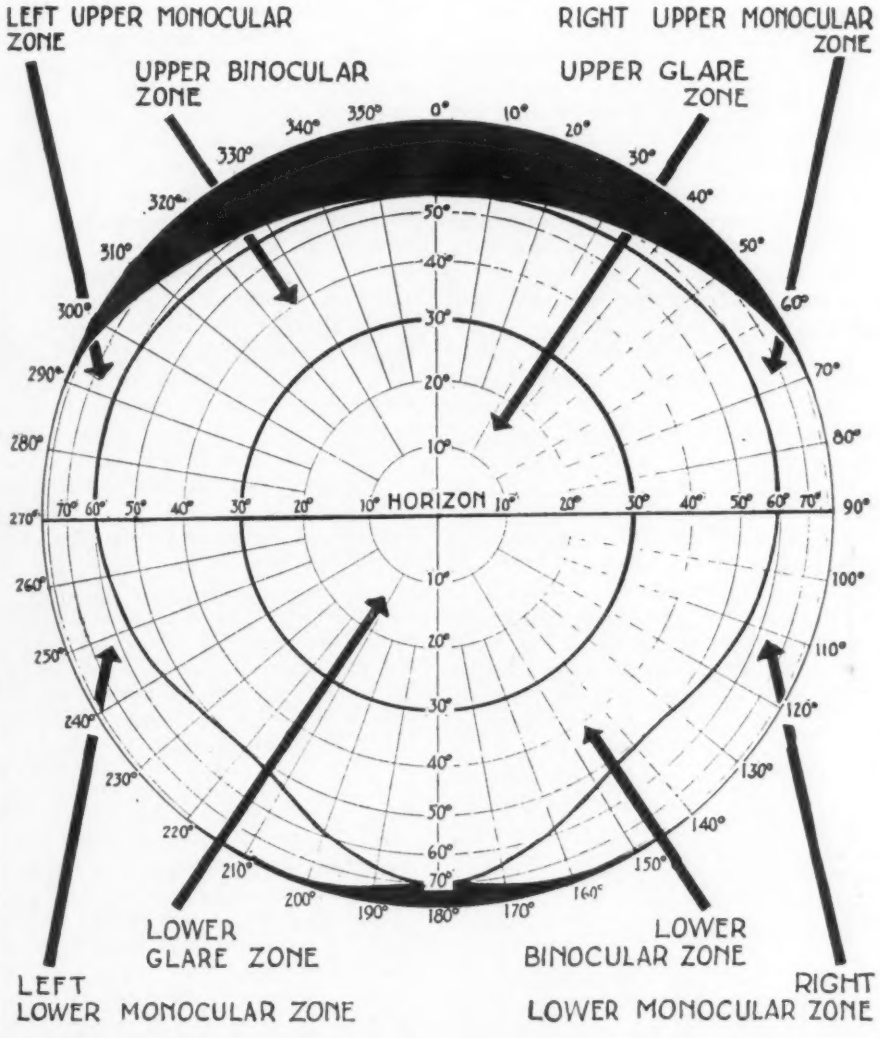


Fig. 2—Zoning of the field of view for purposes of simplifying light-flux studies

The Flux Diagram

How to present the results of 7,700 readings and 30,000 calculations was a problem which finally found its solution in the diagram shown in Fig. 3. The major horizontal divisions (rectangles set off by vertical lines) in this diagram correspond to the zones of the field of view. The area of each rectangle is the same percentage of the total area, as is the area of the corresponding zone to the area of the entire field of view. The vertical scale of the diagram represents relative quantities of luminous flux.

A straight, horizontal line through 1.0 on the flux diagram would represent a uniform field of view, such as might occur within a white sphere. The upper and lower lines shown represent the maximum and minimum range of optimum conditions revealed by the tests.

It will be noticed that absolute light levels are not to be found in this diagram. Logan comments on this as follows:

"As the variations in each field of view are shown in percentages of unity, fields can be directly compared that send, say, 3,000 lumens to the eyes, with fields that send only 20 lumens to the eyes, without the observer being misled, by differences in *quantity* of light, into overlooking fundamental similarities."

As to absolute values, he points out that a suggestion was made that, since artificial lighting levels frequently resemble certain twilight conditions, twilight should be taken as a criterion. Twilight distributions were measured and were found to fall within the optimum limits. He interprets this by saying:

"Man's sensitivity to differences in illumination levels is mild compared to his extreme and sometimes painful

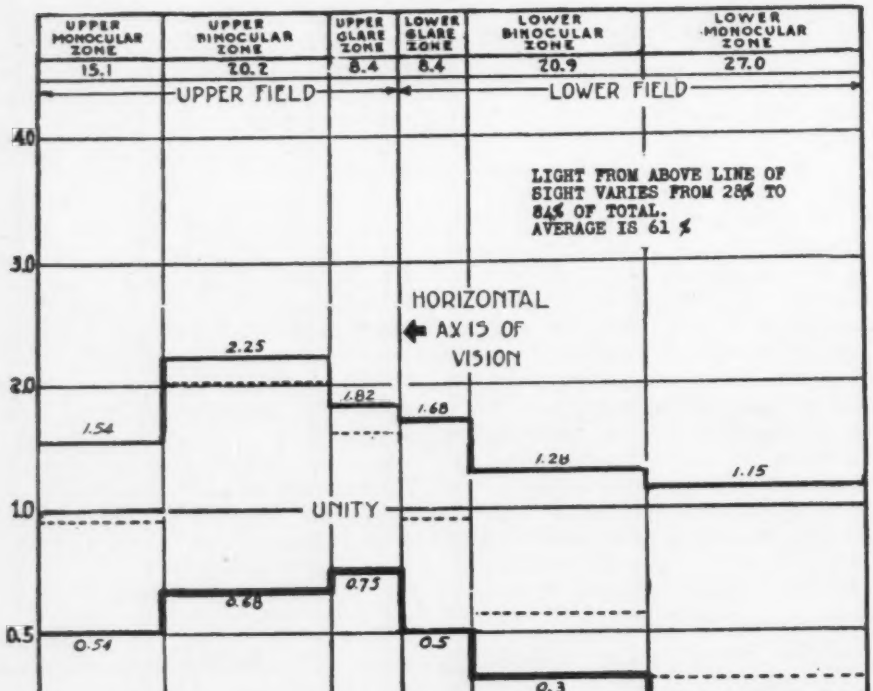


Fig. 3—Flux diagram showing optimum range of maximums and minimums by zones

sensitivity to the manner of *distribution* of light in the total field of view."

Applications

Logan's findings come to their final fruit in their application to a lighting design problem. The procedure consists simply of measuring the zone-by-zone light flux in the entire field of view and plotting the results on the flux diagram. If the results fall within the optimum boundaries, the design is producing a field to which the eye is adjusted.

For indoor use there has been designed a fluxmeter which permits the same sort of measurements as the outdoor meter, already described. The indoor meter employs a different optical arrangement and is more compact. It is set up to look out at the lighted space in the same way that the eye would look at it.

"The advantage of the fluxmeter," Logan writes, "is that it provides, by direct reading of a galvanometer needle, the figure necessary to draw each line segment of the flux diagram, and permits a flux diagram to be constructed within ten minutes that would previously require from two to three days of measurements, drawings and computations."

Light for Living details two examples of design according to the total-field flux-measuring method. In one, an existing installation which had been the subject of complaint, was analyzed. Fluxes in two of the field zones were found to fall outside the optimum range. One was raised by lightening the surface of the desk. The other was high and lowered by turning out one row of lights in a triple fluorescent row. Even though this slightly reduced the total illumination, the resulting diagram closely corresponded with the optimum range, and the user stated after several weeks trial that all annoying effects had been removed. In both examples, manipulation of light directions and changes in surface reflection factors were used to build up optimum conditions.

In his Western talks, Logan described recent comparisons of installations analyzed by both the relative-light-flux method described herein, and the conventional method of brightness ratios. There was a remarkable correspondence of the two sets of results. Arguments for the flux method are that it is quick and simple, free from calculations, and based on the fundamental nature of the eye.

Conclusion

"The writer has of necessity presented the feature of *distribution of light in the field of view* separately from the other features of a luminous environment in order to bring out its importance clearly and without confusion. Further, some of these features, such as brightness, contrast and glare relations are fundamentally features of the distribution. As such they are automatically taken care of in a broad sense when the distribution of the light in the visual zones falls between the optimum lines.

"The writer has not yet come across any case where they were not taken care of but it is conceivable that this method might allow the existence of high brightnesses of small flux content, when they did not appreciably lift the flux content of an entire zone. Further experience might show the need of subdividing the present visual zones (perhaps the upper and lower glare zones) sufficiently to expose the effect of high brightnesses of small flux content, whether direct or reflected, if such brightnesses as may escape under the present method are found to be detrimental.

"This method lifts the mind of the engineer from the theoretical work plane *to the actual reality*—the entire field of view. The standard work plane (horizontal—30 inches above floor) was an inevitable convention in the absence of an over-all method for simultaneously dealing with *all* planes in the field of view. It had serious shortcomings as few seeing tasks actually confine the eyes to a horizontal plane, but behind its use always lay the hope that if sufficient light was sent to this theoretical working plane, the proper proportional amount would somehow reach all other planes. Experience has proved the futility of that hope, and just as common sense shows that the eyes accept, and research has shown that the eyes work with the field of view *as a unit*, engineers should treat it *as a unit*.

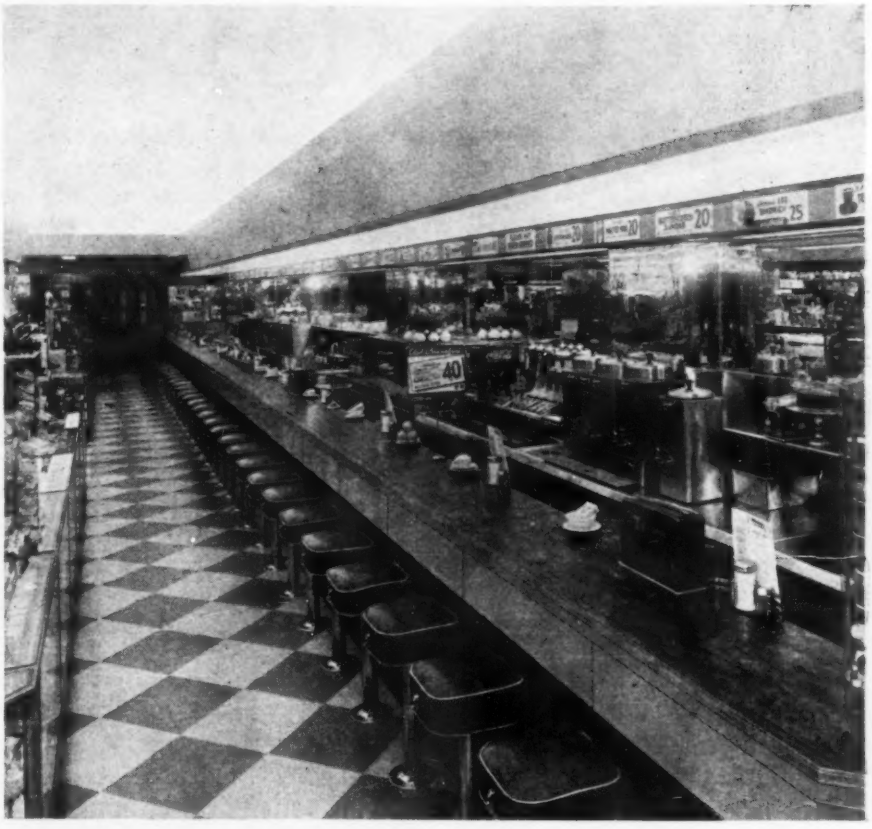
"Finally, when the method of analysis described in this paper, which emphasizes the need for careful control of the light at the source, and at all visible surfaces, is coupled with the instruments to implement it, engineers have a means of adding the optimum luminous "dimension" to all the other optimum dimensions of the ideal indoor climate for man; in short, of designing *light for living*."

● LIST OF NATIONAL STANDARDS for street lighting equipment including transformers, cable, metal standards and wood poles, is now available by writing the Street and Traffic Safety Lighting Bureau, 155 E. 44th St., New York 17, N. Y.

● SUNLAMPS and heat lamps are discussed in Letter Circular LC-827 of the U. S. Dept. of Commerce. The letter, setting forth spectral and safety considerations applying to purchase and use of such equipment, is available without charge from the National Bureau of Standards.

COLD CATHODE FOR A DRUG STORE

WHELAN DRUG STORE, Sixth and Olive streets, Los Angeles; lighting by QRS Neon Corp. Ltd., Los Angeles.



Problem

To light a drug store of the departmentalized type, having general sales area, large food counter, and wall and island sales counters.

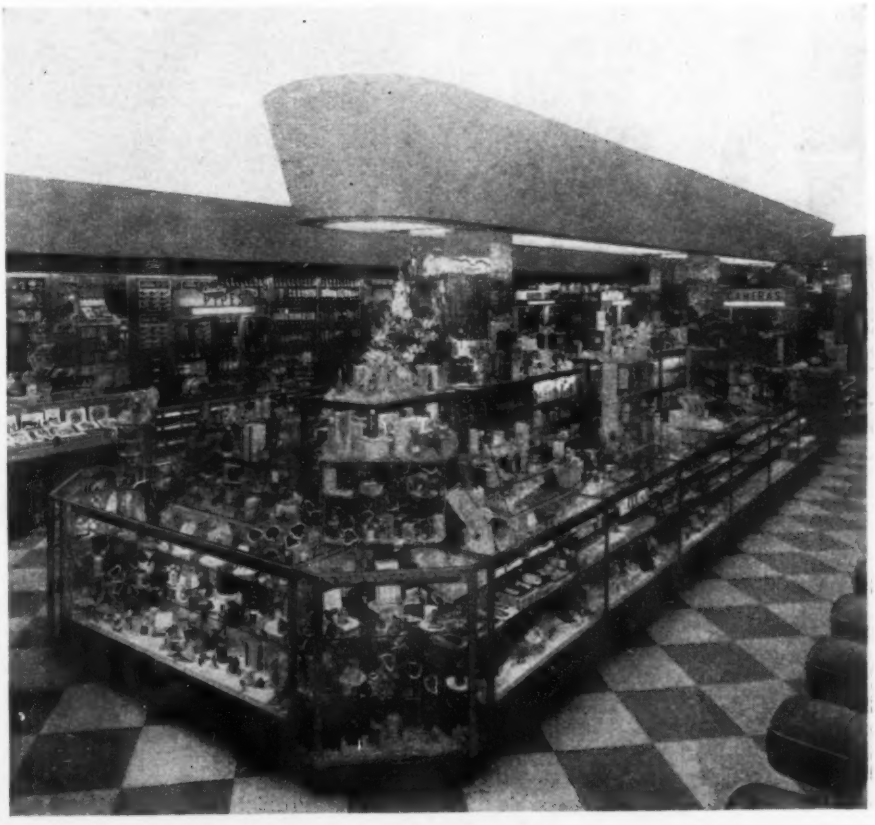
Solution

Totally concealed cold-cathode installation, providing indirect illumination for the general area, and direct illumination to increase light intensities along critical counters and display areas.

The installation plan in general is most clearly indicated by the structure appearing over the island counter in the lower photograph. This provides troffers on top which accommodate the tubes for furnishing the indirect light to the ceiling, and a recess at bottom which accommodates the tubes furnishing the down light.

Four rows of tubes in the upper troffer are run down each side of the structure and curved together at the ends, forming a continuous, four-row loop. A single straight line of four rows is used below, mounted over grid louvers.

At the wall, the indirect installation is the same. The down lighting at the walls is not louvered, but is recessed deeply enough to keep it out of direct view. Two rows are used at the walls for down lighting. On the counter side, this two-row arrangement is repeated, one pair of rows lighting the working area and the second pair the counter itself.



Results

At the time of installation, this lighting gave 50 ft.-candles at the center island, where display lighting was added, 40 ft.-candles on the center counters, and 30 ft.-candles on the soda counter.

Some interesting incidental data on maintenance have developed in the six months since installation. The indirect general lighting has fallen off considerably because of dust on the tubes above the light troughs—they have not been cleaned. But the down light has decreased very little—even at the soda fountain back bar, where it is exposed to steam and cooking fumes.

PCEA Looks Into "the People"

Fall conference opens with leadership talks, probes people and their reactions in sales, personnel and engineering training

BACK into something of the old stride but with the new situations of today to face, the Pacific Coast Electrical Assn. held its annual fall conference at Fresno, Dec. 5-6, and packed the meeting rooms of the two hotels in which sessions were held. Some 350 to 400 attended, according to Victor W. Hartley, managing director, the number being indefinite due to no registration. Representation was from all parts of California, from Nevada and Arizona, and from Hawaii.

President Milton G. Sanders, Central Arizona Light & Power Co., Phoenix, presided at the opening general assembly and the Friday luncheon meeting and his six-feet-plus towered in many of the parallel sessions of the three sections of the association.

With good humor but incisive frankness, Sanders summed up the "Human Relations" program of the opening meeting and laid the responsibility for improvement in this phase of the business back in the laps of those attending. Evidence that his company practices many human relations techniques as a normal part of its operations kept revealing itself in the discussions of what various companies did or did not do.

The Business Development Section had its meetings at the Californian; the other two at the Fresno. To provide a "notebook" of salient topics and discussions, separate reports follow, covering the general assembly, luncheon, and then the separate section and committee meetings. Two of the addresses are being printed in full in other parts of this issue, the talk on management leadership by Ben L. Wells on page 39; J. H. Vivian's report, *Overvoltage Tests on Generators*, page 42. Miss Fenner's talk on selling will be published later.

ONE general session of the conclave was devoted to a thorough-going discussion of "Human Relations" with special emphasis on the development of leadership in all strata of the industry. Arranged by J. A. Long (So. Cal. Ed.), chairman of the personnel committee, the program featured Robert D. Gray, director, industrial relations section, California Institute of Technology, and Ben L. Wells, consultant in leadership training, Los Angeles.

Using as his thesis the definition that "leadership consists of the ability to get the results demanded by the situation," Gray told why leadership is important and explained when leadership should be exercised. For successful application of this definition two steps are essential, he said: (1) In order to size up a situation a leader must have the facts which will determine his course of action, and (2) he must be certain of the results desired and must be able to anticipate what the results will be.

Sanders Long

Robert D. Gray

In looking around to see where leadership is needed, there is always a tendency to put off taking action because the problems involved are too big or too complex, he declared. Every big problem can be broken down into a multiplicity of little problems each of which is amenable to some corrective action. "All situations resolve themselves into local, community, company, department and unit problems," he said, "where leadership can be applied progressively."

While it may be comforting to say that the exercise of leadership is somebody's else job, Gray emphasized that no one in an organization can escape the responsibility of doing the best possible job, and that in itself, was leadership. Top management in the exercise of leadership must pass out responsibility, he declared, if it is to develop leadership abilities in others. Self pity and feeling sorry for one's self will not mix with the exercise of leadership, he pointed out. He concluded by emphasizing that in every organization and in every situation there is always the challenge for leadership and that experience proves that the man who discharges responsibility by finding and solving problems is sought after and adequately recompensed.

In relating leadership to personnel work, Wells asserted that leadership consisted of taking people where they were found in an organization, helping them to overcome their faults and to develop their abilities and then putting them in the best place for efficient performance. He contended that the end result of all personnel work should be increased productivity per man-hour. Delegation to the personnel department of all responsibility for exerting influence on how people are handled has been an effective recent development.

To alleviate friction Wells recommended that the senior personnel officer in a company be on an equivalent level with other department heads and that people responsible for personnel direction should be chosen from the leaders in various departments. Leadership training, he asserted, should begin at the foreman level but management should participate. He demonstrated a training program for changing habits and attitudes and hence developing leadership understanding and qualities.

To prove the pressing necessity for developing leadership in industry, President Sanders announced a special showing of the CIO-PAC motion picture, *Deadline for Action*, prepared by the United Electrical Workers as a vote-getting tool in the November elec-

tions. Lowell Garrison, General Electric Co., speaking for the electrical manufacturers whose reputations and motives are maligned and impugned in the picture, called attention to the degree to which the film followed the Communist party line. At its conclusion, he answered many of the charges contained in the film, pointing to many misstatements and half truths cleverly designed to provoke class hatred and influence voting.

Some concept of the potential new home construction market was given by F. G. Larkin Jr., director of research, Security First National Bank, Los Angeles, at the Friday luncheon. Contrary to popular belief 185,000 new homes have been built in the Los Angeles area since 1941, yet despite that there is a deficit today of 180,000, Larkin said. Citing the Los Angeles area as typical for other sections of the West Coast, he declared that a program for building 80,000 new homes annually for three years would not catch up with the demand.

Two factors make for instability, he said — involuntary forced ownership (the ratio of owner occupied dwellings is up from 37% to 50%) and inflated values. Prices in Los Angeles county are up 185% — higher than for any other section of the U. S. As to probable stabilized price levels, Larkin gave his opinion as 60-75% above prewar levels.

Operating Economics

Chairman, C. J. Nevitt
Vice-chairman, A. D. Bragg

AFTER attending the general assembly, C. J. Nevitt's Operating Economics Section adjourned to Hotel Fresno, where group meetings were held as follows.

Transportation Group

Ernest M. Wright, pinch-hitting for C. E. Baugh, both PG and E, led off

Ben Wells

with a discussion of mechanized equipment.

This group was emphatic in expressing the need for trucks designed for the special requirements of power utilities. Slower speeds, better bodies and better pay loads are needed. Army vehicles are regarded as an interum measure. It was brought out that just as these vehicles represented a highly satisfactory solution to the army's requirements, so a vehicle could be developed for utilities. Army vehicles in utility use have the requisite ruggedness but display serious shortcomings as to body dimensions, economy and turning radius.

Power take-offs drew heavy criticism. It was felt that they are usually something which is hung onto a vehicle after it is designed. A take-off designed into the vehicle should perform better and have controls which don't clutter up the cab or interfere with driving.

A trend toward high-strength aluminum for cranes and booms was evident—24 ST was considered better than 17 ST. Semi-collapsible devices are favored.

More and more are labor saving devices for overhead work being found to pay off. Ratchet type socket wrenches were mentioned as a simple example. More extensive use is being made of small power tools, both in the air and on the ground. Both pneumatic and electrical types were reported as satisfactory, powered by mobile generating units.

P. H. Ducker, So. Cal. Ed., who was scheduled as sponsor for the meeting, was in Sacramento at the time, in connection with proposed legislation affecting utility vehicles. As a result, related subjects were not discussed in detail.

Hydro Generation and Substations

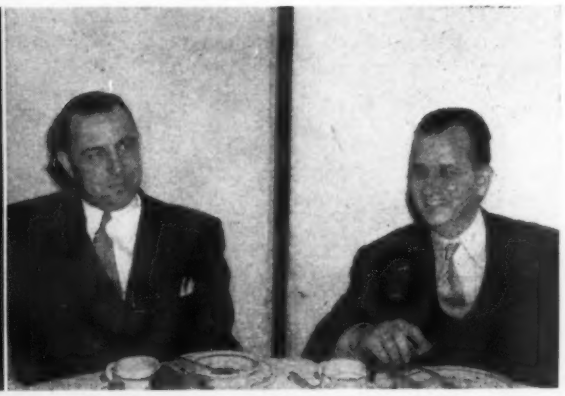
With G. R. Woodman, So. Cal. Ed., acting as sponsor, a top-flight discussion developed on the life determination of windings in rotating machines. Most significant contribution was J. H. Vivian's report of Southern California Edison's studies (turn to page 42).

As is evident also in the Edison report, A. Frank Ayres, Calif. Electric Power, mentioned the recent trend toward Class B insulation. In discussing criteria for predicting winding life, he emphasized the significance of ambient temperatures. But he pointed out that, while theoretical considerations indicated that a winding good for 30 years in San Francisco would last only 18 years in Fresno, and only 8 years in Coachella, this theory was not borne out by experience — the temperature effect is not that severe.

In a paper read for E. A. Crellin, PG and E, it was reported that in the absence of completely reliable tests of present in-service condition, that system got its best answers from study of service records plus consultation with the men most familiar with the particular machine. The first case of trouble to interrupt a clear operating record on an old machine has come to be regarded as a signal that a complete new winding will be needed soon. In general, PG and E has found greatest economy in working old windings overtime, then rewinding with such improvements that other machine factors become the determinants.

In answer to questions by W. S. Moody, G-E, Los Angeles, Vivian said that the effects of surges had been re-

Thompson Jenkins Woodman Wittenberg Nott



duced to minor importance by lifting generator neutrals, and that examination of removed coils had failed to reveal causes of failure consistent enough for use in predicting the life of other windings.

O. A. Gustafson, G-E, San Francisco, pointed out that planned replacement could very easily bring savings through reliability of generating capacity which would outweigh the fractional savings achieved by attempts to squeeze the last bit of life from a winding.

A discussion of automatic and semi-automatic stations carried this subject no further than the thorough treatment it was given at the summer convention (see ELECTRICAL WEST, July 1946, page 84). T. Snell, PG and E, brought the subject into perspective by pointing out that it was in the Fresno region, more than 20 years ago, that automatic operation first came into its own.

Meter Group

In a meeting at which Willard M. Nott, Sangamo, San Francisco, acted as sponsor, particular attention was devoted to the meterman's handbook, leading to the following recommendations:

1. Add diagrams of common connections between current-transformer secondaries and line potential where 5-terminal sockets are used.
2. Print reference data (only) in a 6x8-in. pocket-size handbook with thinner pages and flexible cover, and rewrite the theoretical data as a meterman's textbook.
3. Bring the instrument transformer section up to date, and add data on long secondary leads.
4. Make uniform the data in tables relative to manufacturers' constants.

A. D. Irion, So. Cal. Ed., discussing polyphase watthour meters at very low power factors and very high loads told about troublesome errors arising from spot welders, drill presses running idle, etc. No one offered a simple solution.

R. U. Seagren, representing E. L. Hughes, both PG and E, expressed the unanimous desire for demand meters accommodating standard scales with standard markings, and universal registers.

In a discussion led by K. M. Stevens, So. Cal. Ed., E. B. Kipp, San Diego G&E, urged that the rating of meter sockets be determined by the conductors they will accommodate. He cited the practice of San Diego G&E (and common elsewhere) in keeping maximum conductor sizes to No. 4 with standard socket terminals, No. 2 with bus terminals and No. 4/0 with Anchor terminals.

Kipp also led a discussion of service requirements for installation of sequence meters, reporting how his system uses picture sheets which show, for many different entrances normally encountered, the proper arrangement of equipment and selection of fittings; these sheets are widely distributed to contractors and wiremen.

Integrated Operation

Discussion of interconnections, with Ira Collins, PG and E, presiding, was set against a futuristic background wherein we see the systems of California, and some of those in Arizona and Nevada, operating at 60 cycles as one vast interconnected net.

J. W. Robinson, Leeds & Northrup, San Francisco, opened the subject with a general summary of interconnection experience, pointing to the early New England net which gradually spread south to tie into the Consolidated Edison system in New York. He also pointed out that the midwestern net, extending from the Great Lakes to the Gulf and incorporating 18 million kw. of generating capacity, might more properly be called the United States net. He then described operating procedures and equipment.

His major points: close coordination of all control equipment on all components of the net is a prerequisite; satisfactory control of frequency has been achieved only after selecting just one station to do the job for the entire network; in controlling tie-line loads, particularly to confine load disturbances to the system wherein they originate, there has been a continuous trend toward the use of automatic tie-line load control with frequency bias. This type of equipment has been developed to the point where, merely by turning a dial, the operator may establish the degree to which tie-line load, or frequency, is influencing the automatic control.

H. A. Lott, So. Cal. Ed., said that war loads, if nothing else, had made it clear that his system had reached the limits of effective manual control. He predicted that when Edison is operating at 60 cycles in about two years, the advantages of pooled operation will force extensive use of automatic control equipment. In fact, this trend is discernable now, in that Edison has on order, automatic tie-line control equipment which will control the interchange of power between its Hayfield and Higrove substations by manipulating one of the generators at Boulder Dam.

Robinson had mentioned 350 miles as the existing limit of carrier applications for delivering automatic control signals. Gene Kresser, Westinghouse, San Francisco, pointed out that this limit was due to the requirement, not to the capabilities of available equipment. E. W. Morris, Westinghouse, Los Angeles, pointed out also that war developments have led to carrier equipment which, through the use of narrower bands, can transmit many more simultaneous signals.

Administrative Services Panel Members Weavill, Brillhart, Rice and Wright

As to a future "southwestern" net, 36 generating agencies would be involved. While complete interconnection will be new, power interchange will not, as coordinated operations, including numerous system-to-system interconnections from time to time, have been common practice for years.

Transmission, Distribution, etc.

Discussions covering static capacitors, feeder regulators, and hydrogen-cooled machines failed to reveal any unusual new problems. E. B. Hanson, G-E, San Francisco, presented a paper outlining fundamental considerations in paralleling feeder regulators, pointing to the basic rule that the sum of the compensator settings must be less than the impedance of the circuit. He viewed this as the simplest and most direct approach, but not necessarily

the best one in every particular case.

J. A. Mulkey, PG and E, reported that very substantial savings have resulted from washing insulators with water streams. Costs run from 8c to 14c per insulator. G. L. Hill said that a compact high-velocity water stream was the key to successful washing. PG and E has developed a nozzle which greatly improves the stream. Hill said wetting agents in the water were found to lower the resistance.

Paul Suransky, PG and E, reviewed underground distribution installations in the northern PG and E territory.

R. A. Moulthrop presented a discussion of secondary manhole bus, which will be published in ELECTRICAL WEST.

Don Cone and S. W. Kephart, both Pac. Tel & Tel., participated in discussions of rural long-span joint construction.

A panel of three then explored the responsibility of utility companies in rendering service and making repairs to customers utilization equipment. H. C. Rice, So. Cal. Ed., was chairman, and other panel members were Ed Wright, San Diego G & E, substituting for Charles Davies, and Herbert Weavill, Coast Counties G&E, substituting for E. C. Drew.

Although the discussion was general and there was no unanimity as to details, a general concensus was that utilities do have such a responsibility, but that, where dealer organizations are equipped to render full service, the utility should not attempt to do as much. However, in areas where there is no well-equipped group of dealers to provide service, some of the utilities may have to do it. The discussion also covered costs and the question of making charges for labor and materials. The committee had compiled, in a large chart form the policies and practices of all of the gas and electric utilities in the PCEA and PCGA. Copies of these charts are available for reference.

Friday morning's session dealt with methods used to inform employees. Eugene E. Whitworth, PG and E, was discussion leader. George Henderson, Coast Counties G&E; A. N. Trader, Southern California Gas Co.; Joe Long, So. Cal. Ed., and others, related what their companies have prepared in the way of booklets, house organs, information manuals; how they distribute them, and what each does in the form of classes, opinion surveys, etc.

The talk touched upon union negotiations and the question of whether means could be provided to acquaint employees immediately with the results of negotiations. Unions usually bring back information, sometimes misleading, to their men immediately, but the company's position is not so easily clarified.

Charles H. Warner, G-E, concluded the meeting by reviewing rather completely the extensive information program which that company now has for its employees. Knowing that no one man could reach every group, but that the supervisors can reach most of the groups, great emphasis is made on supervisors' training, and this is followed up by an extensive program of publications and letters directly from President Wilson.

G. M. Henderson with exhibit of booklets, etc., used to inform employees

Administrative

Chairman, L. S. Heseman
Vice-chairman, George Henderson

WHAT to do and what is being done about some of the human problems that had been so eloquently expressed at the first session occupied the attention of the Administrative Services Section on Thursday afternoon and Friday morning. L. W. Brillhart, PG and E, acted as chairman for the two sessions. While the general topic was "Customer Relations," the discussion centered largely on employee training and information.

R. G. Ogborn, Southern California Gas Co., presented a short kodachrome skit depicting what happens to customer requests for information as they are passed around from one department to another. This led into an explanation of that company's thorough training program now employed in preparing its telephone operators to handle the majority of such requests without reference to other departments.

Business Development

Chairman, K. L. Hampton
Vice-chairman, E. W. Meise

BUSINESS touches all fields and all branches of the industry. Naturally then the program of the Business Development Section did the same. Chairman K. L. Hampton, Valley Electrical Supply Co., Fresno, and Vice-chairman E. W. Meise, San Diego Gas & Electric, had a three-ring circus, with twelve acts, and they covered the whole sweep of the lot. The first ring, over which Meise himself presided, had canned gas competition, air heating and air conditioning, and agricultural electrification in full array the first day. The home and its wiring, kitchen, lighting, laundry and the little woman herself, made the second ring, Friday morning, a busy one. Industry and government and store modernization were in the third ring, just as you went out.

Canned gas, alias LPG, once an annoying infant with a tendency to explode, has grown up into one of the electrical industry's challengers, not only for domestic and farm but even commercial business. The tank gas, according to a paper by J. P. McElroy, chairman of the committee, presented by H. Wayne Stone, also of PG and E, Fresno, has 26% saturation in straight electric territory, and its potential spread is to the entire country.

A PCEA survey indicates LPG production has risen from 400,000 to a billion gallons per year since 1925. Its appeals are low operating cost, low appliance cost, availability of appliances, as against high electric wiring cost. Of those who use LPG, 96% do so for cooking, 77% water heating, 31% house heating, 4% refrigeration, and 5% for miscellaneous agricultural uses.

Moreover, it was found, 94% of LPG users are satisfied with its performance, 84% consider it safe; 75% think electricity more expensive, but 17% admit they have never heard the electric story. What might bring LPG users to change to electricity would be cheaper electricity, owning their own homes, availability of low-cost elec-

Reynolds Meise Hartley Rice Fenner Pruitt Hampton Tassie Lind Ross

tric ranges, low conversion cost (wiring) and if LPG were proved unsafe.

Reverse-cycle or heat-pump heating and air conditioning has excited nation-wide speculation, much of it visionary, as to its possibilities but the air heating and air conditioning committee of PCEA, of which H. H. Douglas, Southern California Edison, is chairman, has the facts about it. These data are now compiled in a 52-page mimeographed report just prepared by the committee and mimeographed by the Edison Co. It was the highlights of this thorough study of reverse cycle that Douglas presented.

The data are derived from years of experience now in district offices of that utility and of the California Electric Power Co. and the Department of Water & Power of Los Angeles, several residences, offices, hospital units, a beauty parlor, etc. The Edison Co.'s own experience with the first installation in its main office building is frankly appraised also.

In summary Douglas said that the facts show the system to be a practical and economical means of heating in most parts of southern California below the 3,000-ft. level, that a combination of air and water heat sources may be the best solution, that an average annual load factor of about 47% is possible. He cited a six-room home in Mojave, where temperatures range from 10° to 118° F., which has year-round air conditioning for $10 a month average.

Need to develop trained men in agricultural electrification was stressed by E. G. Stahl, PG and E, chairman of that committee. To take the first step in that direction he told that a school will be conducted this next summer at San Luis Obispo to train high school vocational teachers in electricity in agriculture. These teachers will then be better able to train agricultural students in these subjects.

George C. Tenney, editor, ELECTRICAL WEST, reported for the Northern California Electrical Bureau committee that has prepared and is now ready to publish a new agricultural power handbook for widespread and popular use.

Electrical Living Committee Chairman H. C. Rice, Southern California Edison, in a session presided over by J. S. C. Ross, PG and E, had Victor Hartley expand on the subject covered in his IAEL address, reported last issue and quoted in an editorial; namely, that high installation costs, if the industry cannot do anything jointly to reduce them, may condemn the industry to selling only to a class, rather than a mass market.

The electric kitchen was discussed from various angles by B. M. Tassie, General Electric Co., chairman of the committee, by Bert Reynolds, G-E Supply, and I. P. Pruitt, G. E. Credit Corp. Tassie spoke of the need for the dealer in kitchens to take over the responsibility for the complete installation with plumbers, electricians and carpenters, etc. Reynolds emphasized the necessity to promote a harmonious team of these crafts, for conflict between them can ruin the market. Pruitt debunked the idea that there was plenty of ready money in public hands to buy, for 40% of all families have less than $50 in liquid assets, 70% less than $1,000, and term selling will be needed. He advocated plans to finance all appliances, even to plug-in portables, on the mortgage contract in new homes.

Home lighting, said Leonard Hobbs, Smoot-Holman Co., Los Angeles, committee chairman, has a better chance coming, for fixture manufacturers have formed an American Home Lighting Institute to certify and to advertise and promote good fixtures and adequate lighting in the way that RLM Institute and Fleur-o-lier have done in the commercial and industrial field.

Marguerite Fenner's paper, as chairman of the home economists committee, will be found in the Sales pages of a future issue.

That the automatic washing machine will eventually take 40% of the total market, was the prediction of Fred S. Fenton Jr., Easy Washer, in the report of the home laundry committee, read for him by Blaine Lind of Graybar, San Francisco. The report recommended the standardization of hot water temperatures and urged on dealers that they skip the questionable appeal of how small an amount of hot water is necessary and sell the general idea that automatic washers will do an excellent job with a normal amount of hot water.

Reporting to the industry the progress made by the Adequate Wiring Committee, of which he is chairman, Elbert Kramer, Westinghouse Electric Corp., Los Angeles, told of the educational work done so far, the adoption of new wiring standards for certification. These are uniform now for the PCEA territory and certification is being done by Northern California Electrical Bureau, Pacific Coast Electrical Assn., Bureau of Radio & Electrical Appliances of San Diego County. Southern California Radio & Electrical

Redman Hopkins Hampton Scott

Appliance Assn. Booklets and literature will soon be available and Kramer urged the energetic promotion of the certification program.

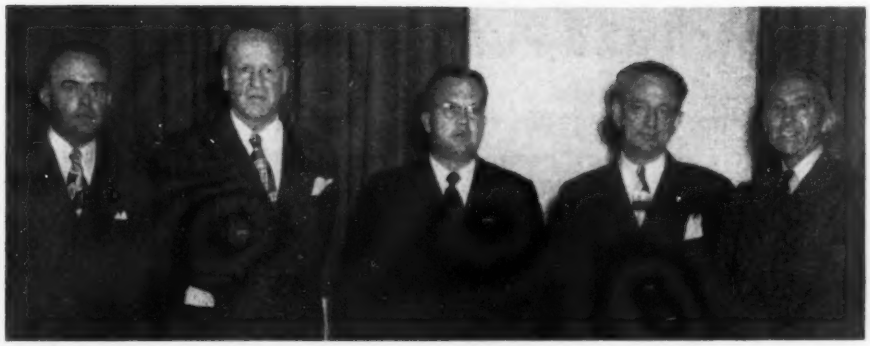
What water means to the West, past present and future, was told to the final session of the section by Verne C. Redman, PG and E, Fresno. S. W. Scott, Graybar, Los Angeles, presided over this last session. Redman reviewed the water law and water history of California in order to give the group the background of the present Central Valley Project and the part the electric utilities have played in water development and power distribution. He was emphatic that the business managed companies saw no loss of load but rather a growth of it due to general prosperity from further development of water resources in California.

Victor Gruen of Gruen & Krummek, store designers and architects, scheduled to speak on store modernization, was unable to reach the meeting due to cancellation of plane flights to Fresno that day.

Ralph Hopkins, Westinghouse Electric Corp., finished the program by reviewing, with excellent colored pictures, new industrial applications of electricity which can be sold to promote industrial efficiency. He predicted that the electrical horsepower per worker can be increased still more by extensive uses of electronics, induction heating, dielectric heating, welding, photocell controls, precipitrons, X-rays, industrial network systems, bus-duct installations, high illumination levels.

Ken Hampton closed the busy two-day session with a note of inspiration, a reminder that other periods in the industry's history had seemed as confusing, as hopeless, as blocked, and yet in those periods some of the greatest developments had been started. Expressing faith in the men and women in the industry on the basis of their past record, he sent all away with the impetus of his own enthusiasm. He advocated that each put to use that which he had learned from the excellent conference program.

● JOHN T. HOLBROOK, manager and buyer of electrical appliances for Denver's American Furniture Co., has been elected chairman of the Rocky Mountain Electrical League's retail electrical dealers' division. This is the only organization of electrical retail dealers in the area and, as chairman, Holbrook automatically becomes a member of RMEL's executive committee, which covers Colorado, Wyoming, New Mexico and the Black Hills region of South Dakota. Other officers of the dealers' division include Harold R. Zeller, vice-chairman, and A. Fuehrer, secretary.



Meise Stahl Stone Tenney Douglas

San Francisco is Next

Definitely decided at the recent convention of the National Electrical Contractors Association at Atlantic City was that the next one, in 1947, will be held in San Francisco, Sept. 8-10, inclusive. A special convention tour is also being planned taking the eastern visitors and delegates through the Canadian Rockies to reach San Francisco and through the Colorado Rockies on the return. A special train, carrying 180, will leave Chicago Aug. 25, stopping four days at Banff and Lake Louise, one day each in Vancouver and Victoria, B. C., and reach San Francisco Sept. 6. The return tour will stop at Los Angeles, Salt Lake City and Colorado Springs for a day each.

● KALMAN BRAUNER, owner of Puget Sound Electric Co., Seattle, was elected president of the Seattle Electrical Contractors Association, a chapter of NECA, at its recent annual meeting. He succeeds Ralph Lane, Industrial Electric Co., who becomes the governor for the chapter. Larry Gattavara, of O. A. Carlson Electric Co., was named vice-president, and Charles Meagher, secretary-treasurer. R. D. Horning is the chapter manager.

● NORTHERN CALIFORNIA Chapter, National Electrical Contractors Association, has proved a busy one for the new field representative, Robert Cook. R. A. Carey, manager, has had him cover the ground with him for meetings in San Jose, Salinas, Bakersfield, Stockton, Pittsburg and Oakland.

● SPREADING its field of activity into Wyoming, the Rocky Mountain Chapter, National Electrical Contractors Association, according to its new manager, Donald Larson, held meetings recently in Denver, Casper and Cheyenne to discuss *New Horizons* and to hear Ralph Johnson, Sturgeon Electric Co., Denver, chapter president, report on the recent national convention. The meeting in Casper, a get-together for all electrical contractors, heard Bob Barnum give a talk on power panels and saw the Westinghouse movie, *Summer Storm*.

● REGULAR monthly meetings of the Utah Chapter, National Electrical Contractors Association, are being held in the Templeton Building office of the chapter, Salt Lake City, according to George A. Howarth, manager. Meeting night is the last Monday of each month.

Division 6

Officers and managers of the National Electrical Contractors Association in Division 6 will hold a division meeting at San Diego, Jan. 18, 19, according to T. L. Rosenberg, Oakland, regional vice-president. Presidents, governors and managers will come from chapters in Seattle, Spokane, Portland, San Francisco, northern California, Los Angeles, Salt Lake City and San Diego. Norman Ferguson, governor for the San Diego Chapter, is making hotel and meeting arrangements. Subjects discussed will be those affecting the region as a whole, with particular stress upon the operation of the pension contribution program which is to be jointly operated by the NECA and International Brotherhood of Electrical Workers. Plans for the 1947 annual convention of NECA in San Francisco will also be coordinated.

● REPLACING A. E. Martin, who, because of ill health, resigned, as field representative for the National Electrical Contractors Association for Division 6, comprising eight Western states, is Robert M. Cook, former field representative for Division 1, comprising eight far eastern states. He is making his headquarters with the Northern California Chapter, at 608 16th St., Oakland.

Research and Personnel Spotlighted

Northwest Association executive, research advisory and personnel groups prepare for year at fall gatherings

APPROXIMATELY 500 requests for technical advice on processing, packaging and management have been made to Northwest Research Advisory Service by utility companies providing this service to their customers in the first eight months of operation, according to Ladner V. Ross, director of the service. This report came out at a meeting of the Research Advisory Service committee of the Northwest Electric Light & Power Assn., in Spokane, Dec. 11. The association is administering the service for eight of its member companies.

Company coordinators who act as liaison between the companies and the director's office reviewed the operation, examined a cost analysis and laid plans for expanded operation during 1947.

The service originally was purchased from Lt. Colonel Bert H. White, Buffalo, N. Y., and is extra service rendered by the utility companies in Oregon, Washington, Idaho, Montana and British Columbia. Briefly, it offers to the industrial customers of these companies non-confidential answers to technical problems gathered from the best sources among some 900 research laboratories and trade press files in the U. S. and Canada, who have offered their cooperation in the solution of these problems.

W. L. Thrailkill, Washington Water Power Co., vice-president of the association and chairman of the Research Advisory Service committee, reported to the association executive committee meeting in Spokane, Dec. 12, that customer reaction to this new service offered by the member companies of the association had been generally quite favorable. "We have a vehicle here for the performance of an extremely valuable service to our customers," Thrailkill said in urging an expanded program. The executive committee approved the findings of the RAS committee and authorized continuance for 1947 on the basis outlined.

Among other reports heard by the executive committee were those of section chairmen relative to plans for spring meetings of their respective sections. Henry Mann, Utah Power & Light Co., chairman of Accounting and Business Practices Section, stated the accountants were planning to meet in Salt Lake City on dates yet to be determined. The Business Development Section with Henry R. Kruse, Puget Sound Power & Light Co., as chairman, has scheduled its spring meeting at the Olympic Hotel, Seattle, May 7, 8 and 9. This meeting is again to feature an intra-industry forum in which appliance dealers, electrical contractors, manufacturers and wholesalers will join with the utilities in outlining a coordinated selling program.

R. J. Davidson, Pacific Power & Light Co., chairman of the Engineering and Operation Section, reported his annual section meeting would be held at the Multnomah Hotel, Portland, April 9, 10 and 11. The time and place of the spring meeting of the Personnel Section is yet to be determined depending on the availability of hotel accommodations, according to O. A. Petersen, B. C. Electric Railway Co., vice-chairman, acting on behalf of L. W. Nims, Utah Power & Light Co., chairman.

Personnel Section

Twenty-four members of the staffs of personnel departments of member utility companies of the Northwest Electric Light & Power Assn. met in the annual fall conference of the Personnel Section of that association in Vancouver, B. C., Dec. 5, 6 and 7, to discuss reports of committees and lay plans for the spring meeting. In addition, at two luncheon sessions the group heard talks on related subjects from two top executives of the B. C. Electric Railway Co. O. A. Petersen, personnel director of that company, and vice-chairman of the section, presided in place of the chairman, L. W. Nims, Utah Power & Light Co., who was absent on account of illness.

A. E. Grauer, president of the B. C. company, keynoted the conference with a discussion of *Responsibilities Placed on Personnel Departments by Management.* The fundamental purpose of a personnel policy is to secure maximum effective production from the manpower at hand, he said, naming these five major heads under which personnel department activities can be organized: selecting personnel, handling personnel, providing services for personnel, recording personnel activities and personnel research. He elaborated the responsibilities of each, bringing out that sound job analysis preceded selection, and that a carefully thought out system of rating individual merit should be the basis of the salary and wage policy.

Trends in utility company organization were discussed by T. M. Moran, vice-president of B. C. Electric, emphasizing the application of committee functioning in his company. Each department and division has an employee-management committee, he said, which feeds recommendations up to the company operating committee consisting of top management and the heads of departments. Decisions that cannot be made by this committee are passed on up to the board of directors. A high degree of coordination in the company operations is attained under this system.

At the executive committee meeting in Spokane: Chairman Henry Mann of the accounting and business practice section; O. A. Petersen, vice-chairman, personnel section; Henry R. Kruse, chairman of the business development section

Scientific selection procedures have recently been adopted by B. C. Electric using the services of J. W. A. Fleury, psychologist, for screening all new applicants for jobs and applicants for promotion. Under this system, said Fleury, an applicant's interests, abilities and personality are scientifically explored and are measured against a "desirable pattern" previously worked out for each job description.

Results of job evaluation studies recently undertaken by several member companies were reported under the committee on this subject, headed by J. E. Allan, B. C. Electric. The maintenance of a job evaluation program was shown to be of major importance. Interest was also manifest in aptitude testing and merit rating as major by-products of job evaluation.

Employees' service and benefits among the several companies had been surveyed by R. H. Sessions, Idaho Power Co., chairman, and were discussed in his absence by W. L. Thrailkill, Washington Water Power Co. It was the consensus that new or changing practices with respect to pensions, medical aid, sick leaves, recreation facilities and other benefits be brought up to date for the spring meeting with the committee recommending sound practices in this regard.

Several companies are planning to go more extensively into employee training in 1947 according to a report of the employee training committee, by C. W. Sherman, Puget Sound Power & Light Co., chairman. Louis Matter and Frank Baker of that company reported on the first linemen's training course conducted by Puget Sound Power & Light Co., ending in August, in which 12 apprentice linemen passed from the lower grades of apprenticeship to sixth period apprentices through a concentrated course in 13 weeks. Foremen and other linemen of the company were instructors. The course is being conducted for another class of 22 men at the present time.

Safety inspection and compliance with safety code regulations were the principal subjects discussed by the accident prevention committee under Don Prairie, Northwestern Electric Co., chairman. The committee plans to hold a special meeting for safety supervisors and accident prevention men at the next section meeting.

An analysis of personnel forms used by several companies, prepared by Fred Groch, Portland General Electric Co., was found to be valuable to member companies in analyzing their own forms from the standpoint of keeping these reduced to the minimum needed for keeping adequate records.

Contractor Group

Membership of the Electrical Contractors Assn. of Los Angeles, has now reached 163, according to M. Feldman, business manager. Starting with a membership of twelve last April and incorporated as a non-profit organization, the organization has been making fine progress. Meetings are held every other Monday evening at association headquarters, 2033 West 7th St., Los Angeles.

Officers of the new association are Alfred Slater, Washington Electric Co., president; Murray Trainer, Kenmore Electric Co., vice-president; Morris Levenstein, Morris Electric Co., secretary-treasurer; Robert Tattleban, Val Electric Co., recording secretary. The board of directors, in addition to the officers, include Joseph Korb, Korb Electric Co.; Hal Bellis, Merchants Electric Co.; J. Roller, Roller Electric Co.; Tom Garvin, Culver City Electric Co.; Marcus Jampole, Nyla Electric Co.

Feldman, full-time business manager, has had a background of electrical contracting, superintending and engineering, and declares that the objectives of the association are to promote the interests of electrical contractors in the purchase and sale of electrical appliances and equipment, cooperation and good will among members and acceptance of fair industry practices, development of electrical codes and technical and safety programs and adequate wiring, representation before legislative assemblies, government agencies and other groups, and fostering of fair and ethical business practices.

● *Are You Selling Substandard Appliances?* was the question before a recent special meeting of the Salt Lake County retail division of the Intermountain Electrical Assn., at Newhouse Hotel, when L. John Christensen, instructor, electrical department, West high school was the speaker. Salt Lake City's new ordinance requiring safety in electrical appliances offered for sale was discussed and questions regarding it were answered. S. Morgan Sorensen, president of the division, F. E. Peterson, chairman and Art Reynolds, manager of the IEA, were in charge of the meeting.

● Norman B. Hume, bureau of engineering, City of Los Angeles, was speaker at a recent meeting of the Electrical Maintenance Engineers Assn. of Southern California, describing the new Hyperion activated sludge plant being built for the city. Two additional features were presented by General Electric Co., the motion picture *Clean Waters*, and music by the General Electric Melody Men. The December meeting was the Christmas Fellowship Party, and was held at Rodger Young auditorium, Dec. 18.

● The Association of Appliance Dealers of Seattle, Wash., has reached an agreement with the Radio Service Unit, Local B-77, IBEW, which grants a 15% wage increase and a 40-hour week for radio and appliance servicemen. The agreement affects nearly 250 servicemen employed by approximately 175 radio and appliance dealers, service shops and furniture stores with service departments. Retroactive to Oct. 1, the wage scale for full-time and part-time journeymen is raised from $1.30 an hour to $1.50. Rate for shop managers went from $1.43 to $1.65.

● British Columbia Chapter, IES, at its Dec. 5 meeting heard Dr. E. Kidd speak on *The Relationship of the Eye to Illumination.* Scheduled for January was a program on hospital lighting, with A. E. Simpson as speaker. Meetings of the chapter, newest in the IES, are held in the Canadian Forestry Assn. auditorium. A large delegation from the chapter to the recent IES conference in Seattle included: Lance Robson, assistant provincial electrical engineer; Lou Miller, city electrician; K. Vaugh Birch, city traffic engineer; Dr. R. F. Sharpe, E. D. King and P. A. Goepel of the school board, all of Vancouver; George Evans and E. N. Chappel of the New Westminster school board; Kenneth Reid, superintendent of street lighting, Victoria. Howard N. Walters, general sales manager, B. C. Electric Co., was chairman of the steering committee for the B.C. delegates.

Dealer Group Resumes

The Inland Empire Electrical Dealers Assn., which lapsed during the war, has been reactivated. Comprised of electrical equipment dealers, wholesalers and manufacturers in Spokane, it has elected as its new officers: John F. Boothe of Brown-Johnston Co., president; Richard Nelson of the Palace department store, vice-president; Frank A. Tool of the Washington Water Power Co., secretary; and Kenneth Hughes of the Hughes Electric Co., treasurer.

Directors chosen for two years are: V. J. Morris of the V. J. Morris Co.; Boothe and Tool. Directors named for one-year terms are E. S. Berquist of the Washington Electric Co.; Kenneth Hughes of Hughes Electric Co.; Stanley Densow of Densow's electric store; Richard Nelson of the Palace, and Lester Barnes of Maxwells.

ELECTRICAL WEST

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1947—As Good as We Make It

IN attempting to appraise the outlook for 1947, sentiment blows both hot and cold. Looking backward there certainly is little in the 1946 accomplishments for jubilant celebration except for the November election returns. In fact most of the complexities and perplexities that darkened the 1946 horizon becloud the 1947 dawn. Material scarcities still hold back production. The industrial machine that functioned so smoothly in producing the weapons of war, groans and stalls in attempting to convert to goods for peaceful living. Inflationary trends continue to build up, as labor seeks higher and higher wages. Labor warfare, as a matter of fact, appears to be the chief obstacle to improvement in the whole economy. Officially the war is not yet over, and internationally peace treaties are still only a hope.

Notwithstanding all this, the outlook has its brighter side. Most of the war-imposed restraints and regulations that were holding back progress are gone. The great body of the public whose wishes should govern, spoke in no uncertain terms in November in expressing dislike for regulations and rationing and bureaucracy. The aftermath of the elections is bound to benefit the electrical industry and particularly the power companies. Equally beneficial will be the curbs which the public wants imposed on irresponsible leaders of labor. Lifting of controls will break some of the bottlenecks and speed the production of scarce equipment and materials.

Irrespective of the short-term outlook for the country and the electrical industry, fundamentally the prospects for continued progress and prosperity have never been better. Backlogs of business total two years' production in many types of equipment. Unfulfilled public demand coupled with ample purchasing power means profitable appliance markets for a long time to come. The housing deficit here in the West is huge. All that is needed to capitalize on these opportunities is a willingness to work together. And the electrical industry is noted for that.

Here Now—"the Human Era"

EARLY-day conferences of the Pacific Coast Electrical Association and other similar organizations concerned themselves with engineering, financing and sales. Those were the days when the physical systems of the power companies were being built and the market developed. Dealers, contractors and wholesalers benefited from the surge of progress which the utilities created. People in the organizations were taken for granted.

Reflecting the new concern of all business—people, either as employees or public—the annual fall PCEA conference at Fresno, reported elsewhere in this issue, aimed all of its attention either directly or indirectly at the human component in the electrical business. The Business Development Section, with its sales viewpoint, was no stranger to the subject of people. Sales programs and campaigns are directed at them. The Administrative Services Section, concerned always with the public and the techniques of service, has long been charged with the task of dealing with the public and with informing and training the people in the business. Only the Operation Economics Section dealt with things, mechanisms and physical plant or mobile equipment. But even here, more awareness of the people who install, maintain and operate was evident.

Just as there have been epochs in the electrical industry that were called "the pioneer period," "the period of finance," the "great period of plant expansion," and "the load-building era," a new one is here now—"the human era" in which all are concerned with finding solutions to human questions such as strikes, personnel selection and training, security, customer and public goodwill and industry cooperation.

In all of these it is the human equation that must be solved.

Some Unforeseen Cost Burdens

TWO transportation developments threaten to place almost impossible financial burdens upon electric utility companies. Expansion of airports and the construction of major automobile freeways both involve expenditures for relocation of lines which bulk so large that the time has come to call a halt. Up to the present, relocation costs have been shouldered as part of the cost of serving an expanding community. However, with plans proposed to establish airports near almost every community with 5,000 or more population and with projected freeways for virtually every metropolitan area, it is obvious that the expense of relocations has become prohibitive.

While the airport problem is not new, it is being intensified by plans for super airports in the metropolitan centers. In this instance the relocations involved affect only electric utilities. However, freeways mean the moving of water, gas and communication facilities as well. Hence the costs to be borne by local customers of these utilities balloon into fantastic totals. Obviously the ultimate burdens are inequitable. Conceivably they could put some of the smaller utilities into serious financial difficulties.

Having recognized the potential danger, some utilities are making strenuous efforts to convince state highway commissions and local airport authorities that some new method must be found for assessing the relocation costs. They assert that their proportion of gas tax funds might be used to finance the relocation jobs. They further contend that relocation of utility facilities is as much a part of the basic cost of these projects as grading or paving. The benefits, they argue, do not all accrue to adjacent property holders, but to out-of-state motorists or at least to people who reside outside the immediate vicinity of the freeway.

The utilities have a strong case for obtaining the relief which they must of necessity have.

Competitive Scramble Coming

UNLESS all signs are wrong, retailing is in for a highly competitive scramble in 1947. The pre-Christmas sales advertisements in many cities were the tipoff. If more proof is needed, then the announcement that one of the big mail order houses is mailing 7,000,000 catalogs for a mid-winter clearance sale (with prices reduced on many appliances) is clinching proof. The wartime retailers' honeymoon, when "buyers were automatons and clerks became snobs and mere order-takers" is over and definitely.

All of which could lead to the conclusion that mortality rates on appliance retailers are going to go up, unfortunately for the industry and for the organizations that will not survive. If losses are to be kept to a minimum and if some degree of market stability is to be maintained, then it is high time for the power company dealer advisors, the wholesalers' salesmen and the manufacturers' merchandising counselors, to begin giving the retailers some sound advice.

One merchandising expert has set forth some of the factors that can contribute to dealer mortality. Study of these will show places where help can be given now so as to insure survival. Retailers will fail because of lack of capital, inability to secure a franchise for well-known brand merchandise, poor store location, lack of experience in merchandising, lack of sound advice from the manufacturer, inequitable manufacturer-dealer policy, inability to provide good service, lack of experience in handling trade-ins, and lack of aggressiveness and initiative.

Only a few of these factors are amenable to correction. However, there are places where helpful counseling programs now will do some good. Instruction in sound business practice will help retailers survive the storms ahead. Assistance in organizing dealer associations would be beneficial. Unless there is constructive work immediately, the competitive scramble could become chaotic.

WHO will run the nation's largest businesses in 1973? Young men back from the war wonder about the country's future and their own future. What will they be doing 27 years from now? The 143 top men who manage 50 of the nation's largest businesses can help answer that one. Twenty-seven years ago, most of them came back from a war, too. All of them, after the war or before, began their business careers from the bottom. One started work for $1.50 a week—11 others for less than $5 a week. 43 others started work for less than $10 a week. 81 others received between $10 and $25 a week. Only 7 received more than $25—the highest getting paid $69.23 a week . . . The average first wage of all 143 was $13.40 a week . . . *Who will manage the nation's largest businesses in 1973? Exactly the same kind of men. Then, as now, they will be leaders with courage, ambition and initiative enough to come up the business ladder, rung by rung . . . Neither the men and women in industry nor the money in industry can be effective without good management. Nothing else is so important to the workers' welfare, the investors' welfare, or the public welfare.*—From an advertisement by N. W. Ayer & Son, Inc.

Appliance Business Looking Up

But manufacturers' men are cautious lest strikes again frustrate factories production, they tell biggest San Diego conference

TROUBLE with telling all that everybody would like to know about the conferences of the Bureau of Radio and Electrical Appliances of San Diego County is that one of them is like a mail order catalog, it has *everything* in it. Singling out what is most significant, or most useful to dealers or others is almost impossible when 50 speakers and 15 events are compactly timed into an afternoon and evening session by Ringmaster J. Clark Chamberlain, bureau manager.

If attendance figures are any criteria, the annual fall conference staged Dec. 2 in San Diego, was the most successful in the history of that well-known organization.

More than 500 appliance dealers, distributors, manufacturers' representatives and salesmen jammed the U.S. Grant Hotel's Plata Real and Gold Room for the luncheon, afternoon and evening sessions. Included in the sell-out crowd were nearly 100 Pacific Coast distributors, sales managers and regional directors of the industry.

Following a call to order by Bureau President Lou Wiese, A. E. (Doc) Holloway, vice-president in charge of sales for the San Diego Gas & Electric Co., opened the conference program with an address on San Diego's optimistic electrical future. With facts and figures, Holloway backed up his prediction that San Diego's appliance industry faced the greatest opportunity that it has ever had.

"From December 1940 to December 1946, the San Diego Gas & Electric Co. increased the number of its electric customers from 101,600 to 139,600, or a net gain of 37%. During the past twelve months, we have gained 6,300 electric customers, 50% of whom are in the rural territory. We have at present about 5,000 unfilled orders for electric service," Holloway stated. "This is as great as any period during the war."

This added load has been reflected in the company's system's peaks, he said. "Our greatest wartime peak on our electric system was 164,000 kw. On Nov. 20, 1946, the company peak requirement was the greatest in history with 174,000 kw.

Much of this added load is due to commercial and domestic electric customer growth. "On or about V-J Day, our company made estimates of the requirements upon its system in the postwar period. Our prediction that we would lose a certain amount of industrial load has been proven correct, but the commercial load of stores, office buildings and business houses has increased far greater than we expected. Instead of an exodus of war workers from our community, some sections of our rural areas have increased their population by better than one hundred per cent since V-J Day!"

T. J. McIntire, Pacific Coast manager of the Yorkville Paper Co. and recognized as one of the West's outstanding authorities in the frozen food field, stated that during his recent tour of the Pacific Coast, he found literally scores of new manufacturers going into the home freezer business. A lot of these folks, he said, were just "cats and dogs" starting out in a brand new field.

"A lot of us think that because we're old-timers in the field, that we're all set for a big business ahead. But I want to tell you that one of these days we're going to refer to some of these newcomers as *Mr.* Cat and *Mr.* Dog. There's one appalling fact stands out in my visits to both newcomers and old-timers: practically no one has made any plans to sell his equipment. If we are going to stay in the home freezer business, we've got to tell people what to do with a home freezer, why they should have one and how they can use it. We've got to tell people how to prepare frozen foods, how to wrap them properly and how to package foods in meal sizes.

"You know, a lot of us have been chasing a bear down the road for the last couple of years and some of us have been looking at one end of that bear too long. One of these days that bear is going to turn around and when he does, we'd better have a pretty good story to tell if we don't want to get chased off the road!"

A home freeze manufacturers' panel discussion followed in which short talks were given by the following men: William Dudley, sales manager of Frigidaire; Ray Gould, sales manager of Weber Showcase and Fixture Co.; Ed Bassler, former vice-president and now regional manager of Gibson Refrigeration; Lou Swenson of Sherman-Swenson and Associates; Ed Barnes, branch manager of Kelvinator and Steve Maher, manager of the General Electric Appliance Corp.

Maher reported that, in a recent experiment conducted by the General Electric Co., 75 home freezers were shipped to a town of 25,000 population. The freezers were advertised and 74 units were sold in a matter of hours. Ed Bassler estimated that the immediate home freezer market could absorb between 520,000 and 1,450,000 units.

Concluding the luncheon program was a report by O. G. Thompson, chairman of the bureau's advertising committee. Forrest M. Raymond, superintendent of advertising for the San Diego Gas & Electric Co., reviewed the bureau's advertising for the past six months. Expenditures this year, he said, exceeded $18,000, or more than any advertising expenditure for bureau promotion prewar.

The afternoon session opened with a talk by Elbert Kramer of the Westinghouse Electric Corp. on *The Flexibility of Electric Living*. Kramer illustrated his talk with a display showing miniature appliances arranged in order of their wiring circuits.

Santa poster, "Doc" Holloway and Lou Wiese, bureau president, above; J. F. Zweiner, L. Lauritzen, E. S. Bailey

Just how poor wiring can result in returned merchandise and profit losses to the dealer, was aptly demonstrated in a short play staged by E. W. Meise, chairman of the bureau's adequate wiring committee. The play forcibly brought home the fact that inadequate home wiring may well prove a bottleneck to future appliance sales (See Sales Guide, p. 71).

Speaking on *Have We a Mass Market Product*, Victor W. Hartley, managing director of the Pacific Coast Electrical Assn. and president of the International Association of Electrical Leagues, warned that high installation costs may prove to be the stumbling block for sales of electric ranges, sinks, disposals, dishwashers and other items requiring special installation. This is an industry problem, he said, and all must cooperate to see that these costs are kept at a minimum.

J. F. Zweiner, chairman of the bureau's electrical contractors division, reported that electrical contractors were being approached on the adequate wiring program through the division's meetings. Ivan Lauritzen, chairman of the bureau's electronic committee, reported that the bureau's Electronics Division had been presenting programs to keep members abreast of the latest developments in sound equipment, service problems, and problems peculiar to frequency modulation and television. E. S. Bailey, chairman of the bureau's commercial refrigeration committee, stated that commercial refrigeration dealers are studying the possibilities of the frozen food market and that plans are now underway to set up classes to teach the principles of preparing frozen foods to those who are selling frozen food equipment.

Following the dinner and musical program, a panel discussion was conducted by San Diego's radio network station managers under the leadership of Chairman Jack Gross, manager of ABC's San Diego outlet, KFMB. Gross introduced San Diego's newest radio station manager, Purnell (Mike) Gould, who announced that within a few days Columbia network will have an outlet in the San Diego area on KSDJ. Policy of the station will be to stress items of local interest, present agricultural programs for the benefit of rural listeners, education programs of interest to the public, and dramas featuring local talent.

Marion Harris, manager of San Diego's NBC station, KFSD, revealed that today, 62% of San Diego's listeners tune regularly to San Diego stations. This is more than four times as many as were regular San Diego listeners ten years ago. Fran Ide, manager of San Diego's Mutual outlet, KGB, emphasized to the bureau members that "we're all in this business together. If we present good programs and you, in turn, sell high-quality radios and maintain adequate service on them, we should all enjoy success."

Manufacturers panel and Toastmaster J. Clark Chamberlain, in front, at evening session. C. P. Culbert, Proctor; Cy Frellson, G-E Supply; Morrie Breslow, Utility Appliance; Bill Cranston, Thermador Wendell Kinney, Kinney Bros., distributors. Theirs and opinions of other factory men were reported in the last News-Letter.

Broadcasters who told how programs and sets go together: Managers Jack Gross, KFMB; Purnell Gould, KSDJ, San Diego's newest; Fran Ide; KGB; F. M. Raymond, adv. mgr., San Diego G. & E. Co., Marion Harris, mgr. KFSD

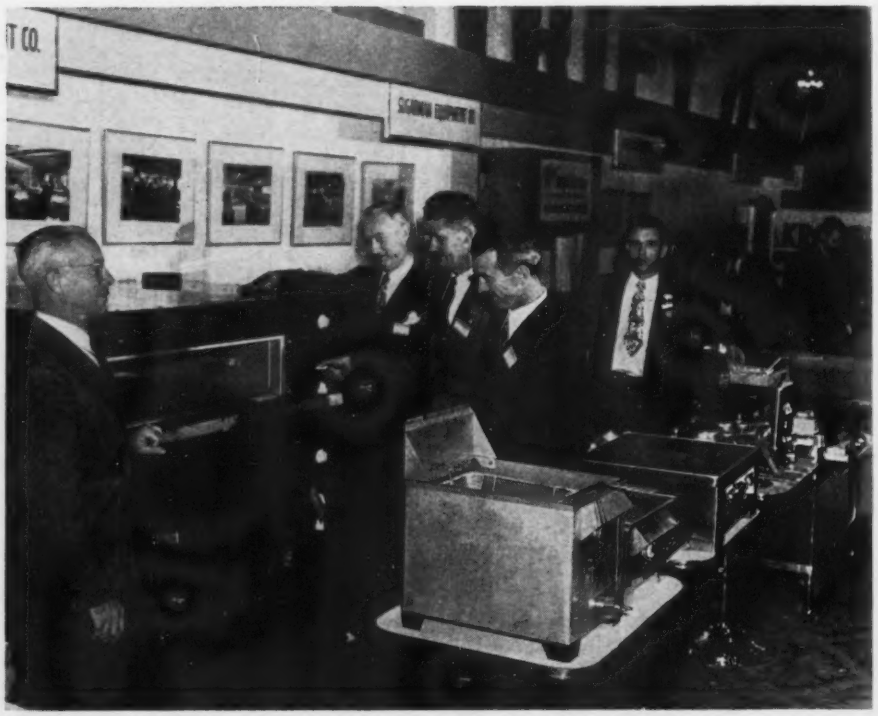
Milton G. Sanders, president of the Pacific Coast Electrical Assn., stressed the importance of good public relations in the conduct of a successful business. "If we succeed, it is because people enjoy doing business with us. In turn, we do business with people who take a personal interest in us. If we show a personal interest in our customers, they will be bound to come back, over and over again. Today, we have the most wonderful opportunity of all industries. Let us make the most of it by conducting our business in such a manner that customers will enjoy walking into our store." He was introduced by a former PCEA president, Hance Cleland.

San Diego's bureau is taking an active interest in sales training. This was brought out by a report made by Paul A. DuPont, chairman of the bureau's sales training committee. More than 80 persons had availed themselves of the sales training classes being presented. These classes, he said, were designed for salesman and executive alike. As evidence that the course is effective, DuPont presented five of the course's graduates who gave brief testimonials on the personal value each had received from the course. The "graduates" included a veteran appliance salesman, a sales manager, an appliance dealer, a distributor's salesman and a sales training counselor.

The program ended with a brief address by Mayor Harley Knox, who stated that San Diego now needs 19,500 new homes immediately. These homes, he said, would be a rich market for the sale of many appliances. He confirmed the opinions expressed by others that San Diego's appliance industry faced a great opportunity.

Told in Pictures

When the National Restaurant Assn. held its convention in Los Ageles recently electric cooking was on exhibit in ten booths sponsored by six electric utilities. Pictured are S. L. Cipperly and G. N. Hawley, Southern California Edison, and D. J. Murphy and E. G. Alberts of Los Angeles Department of Water & Power. Restaurant men were found to be eager for electric equipment, impatient for quick deliveries



Somers Appliance Service of Los Angeles delivers one of first new Easy spin driers to film actor Paul Guilfoyle

Just moved into a new building, Taylor Wholesale Electric Co., at Inglewood, has this attractive entrance and fixture display. The new place has 10,000 sq.ft. of space, carries fixtures, supplies, major and traffic appliances, serves the southern California area

Took Mrs. Wallace Barlow of Mt. Shasta, Calif., almost ten years to collect the 21,750 pennies she trucked in to C. F. Gower, electrical dealer, to buy the Bendix automatic washer she'd been yearning for. But she made it before Christmas and is happy. So many pennies, though, almost choked the local bank, which would only take $10 worth per day, requiring 22 deposits

ELECTRICAL WEST Sales Guide

NEWS LETTER FOR THE ELECTRICAL MERCHANT OF THE WEST

January
1947

©

Market Time

Market Week this year will really be something! The Western Merchandise Mart is recovering a little much needed display space from OPA and other war agencies that have camped in it and that manufacturers and distributors have banged at the doors to get. So by Market Week, Feb. 3-8, some new appliance exhibitors will have moved in and several old-timers increased their space. The new wing is going up rapidly but won't be ready until the fall market. And the bureaucrats give up hard.

Some new

Quite a number of new models will be shown, as many manufacturers have announced 1947 lines with improved features over the previous models. Many long-ago-announced products will be shown for the first time. It is going to be a market at which the heat will again be turned toward selling, for most makers figure the cream of the buyers' market has been skimmed off.

Time sales

In fact Senator Bridges (Rep. N.H.) has made a claim that Regulation W is prohibiting many wage earners from being able to buy refrigerators, washers and ranges because of its high down payment and large weekly installments.

Careful now

From several credit sources comes advice to watch credits carefully. You may have noticed your own supply sources becoming more insistent and cautious.

Appliance dinner

Big event appliance-wise will be the Western Radio and Appliance Trade Dinner, Wednesday night, Feb. 5. George L'Amoreaux, Mart promotion manager, has lined up J. W. Stigall, Launderall sales manager, Detroit, to talk on "Development of the Automatic Home Laundry Industry" .

Not hay either

"Something has been added and it ain't apple honey" is what E. Carl Sorby, sales vice-president of Geo. D. Roper Corp. will tell the crowd. R. E. Fisher, sales and public relations vp. of PG and E., San Francisco, will be general chairman.

Housewares show follows

Right on the heels of Market Week comes the Western Gift, Toy and Housewares show, Feb. 9 to 13, under Kay Leber. It will overflow the San Francisco Civic Auditorium, where there will be 268 booths, and have 25 displays in the St. Francis and Sir Francis Drake hotels, beside the permanent displays at the Mart.

Among new exhibitors at the Mart will be: Premier Vacuum Cleaner Division, G-E. where Bob Baird, district manager now headquarters; Sessions Clock Co. with Western regional sales representative Harry Solomon; the Spector Co., with Burkaw Electric Co. phonographs and other lines of lamps, table appliances and floor polishers; John Horan, with Doric Lamp Mfg. Co., Clark Crafts, and Suttle & Asmus lines; Don Thiele, showing Golden State Lamp Co., San Francisco lamps. Bendix Radio division with George Dyna in charge; others too, as arrangements are made.

New exhibits

Three-quarters of the display space for the second annual Construction Industries Exposition & Home Show, at Pan-Pacific Auditorium, Los Angeles, June 12-22, is already sold, said A. L. Stone, Stone Electric Supply, Los Angeles, treasurer of the non-profit corporation of 14 trade associations which puts on the show.

Advance booking

Kelvinator has been carrying on its exceptionally fine sales training program in the West. Many groups of dealers in southern California were put through the training by factory men and Ed Barnes, of the Los Angeles office. Oakland zone manager Postuma had 200 dealers from northern California and Nevada for the course. Harper-Meggee Co. did the same up in Oregon and Washington.

Train for sales

National Housewares Directory, put out annually by the Associated Pot & Kettle Clubs of America, of which Charles G. Putnam, of San Francisco is president, will come out in a new 8¼ x 11¼ in. size. Osgood Murdock, who produced the first edition, is consulting editor and Olive MacDonald is managing editor. Office is in the Western Merchandise Mart.

Housewares directory

A nationwide campaign developed by the National Electrical Manufacturers Assn. will soon be put into play locally by your local utility. It has the slogan, "Go All-Electric the Modern Way", and it is especially designed to help dealers develop the farm and small town for electrical equipment. This symbol will appear all over pretty soon. Its a good deal to tie to it and promote your business with it.

In a move to get more sheet steel assured it for its refrigerator and range production, Gibson Refrigerator Co. has joined a Detroit group that will take the entire output of Appolo Steel Co. Its secretary-treasurer, Frank S. Gibson, becomes vice-president of the new group. Production of both range and refrigerator is on the upgrade now.

Steel assured

Frigidaire produced its eight millionth refrigerator before ending 1946. It has also announced production of a new glass-lined electric water heater, in 30 and 50 gal. sizes, single or double element. Production will be limited to four models.

Cold and hot

Wholesalers inventories began to pass sales in the last weeks of 1946, for the first time since the war. Sales volume in December evidently was the biggest yet.

Balancing

Rheem Manufacturing paid fine tribute to the late dynamic Al F. Rice, western appliance sales manager, who was killed in the airplane crash near Burbank, Nov. 13, in its Dec. issue of Rheeminder, company house magazine.

Tribute

Ray Godwin, former Philco representative and Ralph Christie, formerly with Thompson & Holmes, have formed a new distributing firm, Raycraft Co.; offices in Oakland until space is ready in the Western Merchandise Mart; handling Presto cookers and Martin outboard motors for northern California.

For themselves

Trilmont electric heater won the Lewis & Conger annual home safety award last year. Award for this year will be made in February. It is for new products marketed the previous year for the first time.

Safety award

Now it is Hotpoint, Inc., for keeps. That long handled monicker, Edison General Electric Appliance Co. is discarded and Hotpoint, Inc. will carry a subtitle, "a General Electric affiliate" only, says ex-westerner Ray W. Turnbull, its president. Hotpoint is starting a $17,000,000 expansion program to triple its facilities, too. The commercial cooking equipment will carry only the Hotpoint name too.

Hotpoint it is

Proctor has announced another far reaching policy of giving guarantees of customer satisfaction with its products. This is backed by a strong service station program.

All the way

Thermador is making available to everybody a tool that it developed for its own factory so successfully -- a twin carbon rod soldering tool. Operating through a small transformer the two carbon terminals, closely spaced, have a 6-volt potential across them to generate instant heat on contact with metal. The tool operates so cool that it is highly desired by workmen.

Quick soldering

"Escort" is the name Escort Sales Co., Inc. of New York gives to an electric razor exclusively for the gals. It has a circular head to operate under the armpits, thoroughly protected; comes in a choice of colors, sells at $18.95.

Lady shaver

That the electric blanket will bring a fashion trend toward sheer nighties is predicted by Mme Thea Tewi, the naughty nightie top creator. She has a few models designed just for the electrically heated bed, wearable the year 'round. Ought to sell plenty of blankets to the rugged ones who like to sleep raw, too.

Woo woo!

Ingersol Steel Division of Borg Warner has been making headway with its complete plumbing-heating-kitchen packaged unit for new houses or remodeled old ones. Sold 500 in 1946 and sets a goal of 25,000 in 1947, pushed by a big advertising drive to home builders and owners.

All in one

Alleging monopolistic practices, the Department of Justice has filed an injunction against Bendix Home Appliances and Telecoin Corp. for its agreement on distribution of coin meters to Bendix equipped rental laundry operations. Bendix has replied it is operating under the Fair Trade and Miller-Tydings laws.

Alleged

New models of Universal's 1947 line were shown to distributors of the West at a three-day conference in San Francisco, Jan. 8-11, when Bret C. Neece, vp. and general sales manager and nine factory executives from Landers Frary & Clark came West. Included in the new appliances is an electric blanket. Entire redesign is promised on several others.

Show distributors

The ice companies are still after the refrigerator business and will be your competition. Will tax themselves 3¢ a ton on ice to spend 3/4 of a million in advertising in 1947.	Cold facts
Estate-Heatrola division of Noma sprang a new gadget on its ranges at the Chicago market. It's a Defrost-all, to quick defrost quick frozen foods.	Quick
That electric mousetrap you see pictured so often and which has been pretty widely distributed, is NOT Underwriters listed or approved. Inspectors say it is dangerous. Remember if some child gets killed by one you may have a big damage suit on your hands, as well as conscience trouble.	Trap
Lewyt Corp. is launching a new canister-type vacuum cleaner with a half million dollar ad campaign.	New
General Electric showed its new automatic washer and two new rotary ironers at the Chicago market. Don't expect samples 'til late spring or summer however.	Also
Frostair division of Liquid Carbonic, tied in with General Tire, has a new duplex freezer-refrigerator job in one package that will sell for around $550; combines a 7-cu. ft. refrigerator, a 3½-ft. frozen food locker and an icemaking compartment for high speed cubes. Will be sold through trade channels.	Three in one
Duro Test Corp. will also come out with a Slim Line lamp, it has announced. Ingeniously it has combined four reflector heat lamps into an electric space heater it calls Ray Diator, to sell at around $33, with two-switch control for 500 or 1,000 watts. Lamps rated at 10,000 hr.	Clever idea
Norge sprang its "20th Anniversary" line of appliances at the Chicago market, and showed a new 9-cu. ft. refrigerator with its large frozen storage space across the top, as well as improved versions of the 1946 line, with freezer down one side. It also showed a re-engineered standard washing machine.	1947 line
Both Palouse and Lewiston chapters of the Inland Empire Electrical Dealers Assn. have been reactivated, following the revival of the Spokane chapter recently. Palouse chapter is made up of dealers around Pullman and Moscow. Charles Fanning of Oaksdale is chairman. Carl Harris is chairman of the Lewiston group.	Revive league
Toastmaster will be sold under the Fair Trade laws, the Toastmaster Products division of Mc Graw Electric has announced. Retail list is to be $18.75, which returns the dealer his prewar margin.	Fair Trade
Clever packaging of a wall lamp is being done by Phil-Mar Electric, Inc., of Cleveland, maker of fiberglas shades and cast aluminum, reflector bowl "packages of light." The package also serves a dealer as a display piece.	Pack of light
Stewart-Warner, which flew to the West its first table models is air-cargo-minded. It flew a cargo-plane load of 165 console and table combinations to Edward F. Hale Co. for pre-Christmas sales. Some sets were on dealers' floors 15 hr. after leaving the Chicago factory.	Flown

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ELECTRICAL WEST
Sales Guide

FOR THE ELECTRICAL MERCHANT OF THE WEST © January, 1947

Has Wire Got You Choked?

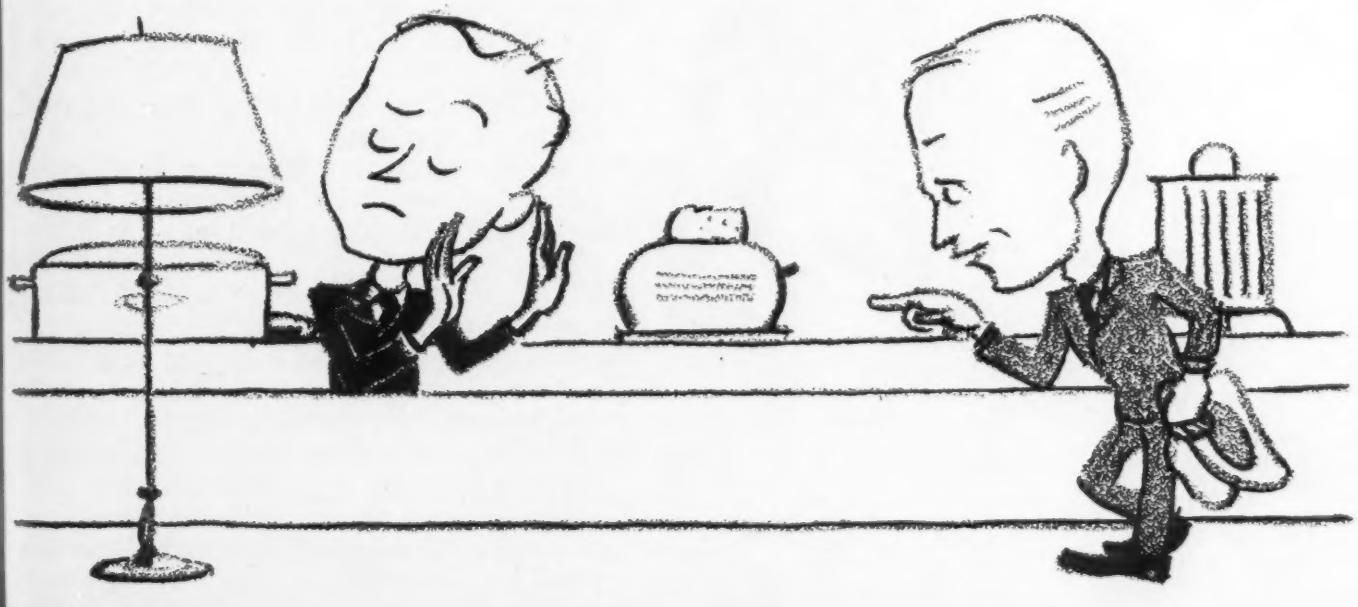
IF you are selling appliances and not doing any contracting, it is natural to think only of your appliances. But fortunately or unfortunately, electric appliances must be fed electricity in order to work. And that electricity comes over wires.

Thus, like it or not, wiring is what you are stuck with, or stuck by. If there isn't enough of it, it is **your opportunity to sell** that is choked off. And therefore, whatever can be done to promote more of this wiring, the better your chances to sell; the more chance that what you sell has no comebacks and **stays** sold.

On the next two pages you can see all this in a little skit. Just put yourself in it wherever the script says, "Dealer." You will find that you fit right in the picture—both to your amusement and concern.

The others are familiar people, the folks who come in to buy from you. Let your imagination have free play and you can name them from your own clientele. The place it all happens is right in **your** store.

(The author of this particular script was E. F. Meise of San Diego Gas & Electric Co., and it was presented to the amusement and education of all at the recent annual fall conference of the Bureau of Radio & Electrical Appliances of San Diego County —but it fits **your** town, **your** store, **your** appliance selling.)



"Who, Me?"

Representative—I'm the dealer man from the Electric Co.

Dealer—So! Glad to know you. Perhaps you can tell me when my brother-in-law is going to get service at his new house in Sunshine Acres.

Rep.—No, but I'll get the information for you from our customer extensions department. What I came to talk to you about was that we are now certifying Adequate Wiring in this area, and I'd like to show you how you are interested in Adequate Wiring.

Dealer—That's okay for electrical contractors. It makes business for them. But my customers seem to get by on their old wiring even though we sell them more and more appliances. You'd better go talk to the electrical contractors. Here comes a customer, see you later.

Lady—I'm looking for a floor lamp. This one looks darling!

Dealer—Yes, it is a lovely lamp. Just a sample we got in today. But I will sell it to you if you like.

Lady—It's just what I've been looking for. Will you charge it to my account?

Dealer—Yes, my boy will carry it to your car for you, for here's another customer. Thank you, madam.

Man—Good morning. Today's my wife's birthday, and she wants an electric roaster. Do you have one?

Dealer—Yes, just one, and it's a beauty. It is the only one I have, but I will let you have it.

Man—Fine! Charge it to my account, and gift wrap it, please.

Dealer—I can charge it to you, but I can't wrap it. Shortage of paper.

Man—Okay, I'll take it as it is.

(Another man enters.)

Chap—Say, I need an electric heater.

Dealer—I have just the thing for you. This heater does a good job and uses only 1,620 watts.

Chap—I'll take it, thanks. Please charge it to my account.

Dealer—Business is good. Here is another customer of mine. What can I do for you?

"Yes, You!"

Guy—We sure need a toaster. Got one?
Dealer—You are lucky, my friend. I believe we have one automatic left. Yes, here it is.
Guy—Swell! Charge it to my account.
Dealer—Well, that's that. No more merchandise. Might as well close up for the day and go pester my distributor for some more appliances. (He puts up a sign, "Closed for the Day.")

Scene II—Next Day

Dealer—Didn't get very far yesterday. I'm going to wire the manufacturer to see why my jobbers don't give me more appliances.
Lady with the floor lamp—I just can't use this floor lamp. I'm sorry. You see we do not have an outlet anywhere near where I want to use this lamp. The octopus outlet is all filled up, and we can't get an extension cord to run to the other side of the room. Please credit my account.
Dealer—Just as you say. I'm sorry too.
Man with the roaster—Here's that roaster I got yesterday. It's no good.
Dealer—(Looks at roaster, all smoked up and dirty). What seems to be the trouble?
Man—I don't know, but when we plug it in, the iron quits running and our roast never gets done. We finally had to finish the roast in the oven of the stove.
Dealer—I'm sorry, sir. I'll have our repair man look it over to see—
Man—My wife won't have it in the house now. Just credit my account.
Chap with the heater—Say, what kind of a gyp is this? This heater won't heat. What's more, it put out all the lights when we plugged it in.
Dealer—(Sees heater all scarred up.) That's funny. It's supposed to be one of the best heaters too.
Chap—Well, you can have it back. I'd heard electric heat was the bunk. Now I know it. Credit my account.
Guy with the toaster (who has just come in with it all smoked up, too)—You can keep this toaster too. We don't want to wait all day for a piece of blonde toast.

Dealer — Hey, wait, that's a first class toaster. I tried one out and it makes fine toast. Wait, I'll show you.

Guy—It's no use. We don't want it. Just take it off my account.

Rep. from the Electric Co.—Good morning.

Dealer—What's good about it?

Rep.—Anything the matter?

Dealer—Yesterday I sold all these appliances. Today they are all back. Yesterday I had a few new appliances to sell. Today I'm in the **second-hand business!**

(He gets out a sign, saying, **"Used Appliances—Name Your Price."**)

Rep.—That's what I was trying to tell you. I'll bet every one of these appliances was returned for the same reason — inadequate wiring.

Dealer—What do you mean?

Rep.—Well, the Lady returned the floor lamp because her home does not have enough outlets, conveniently located.

Dealer—Yes.

Rep.—The Man didn't want the roaster because his home wasn't equipped with individual equipment circuits to serve such an appliance.

Dealer—I begin to see.

Rep.—That Chap returned the heater because his service entrance did not have sufficient capacity.

Dealer—Don't tell me—

Rep.—And that last Guy brought back the toaster because the wires in the circuit to the toaster were too small.

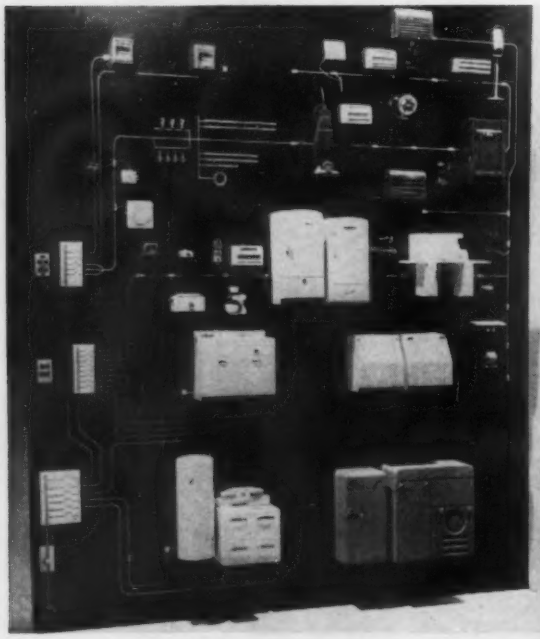
Dealer—So wiring is responsible for all this, huh?

Rep.—Inadequate wiring, yes. But with **Adequate Wiring** the customer has:

1. **Plenty of outlets,** properly located,
2. **Plenty of circuits,** of sufficient size to distribute the electrical load properly,
3. **Circuit breakers** instead of fuses,
4. **All wiring** and workmanship of highest quality.

Now if the homes of your customers have Adequate Wiring, your lighting and appliances **stay** sold. You save by not having to discount merchandise that is returned because of inadequate wiring.

Dealer—Well, thanks chum. From now on, count on me to **tell** my customers to put in Adequate Wiring and plenty of it. I see that every dealer **does** have a stake in it.



How wiring affects your market is vividly shown in these two pictures by Westinghouse, illustrating the minimum wiring (below) in a "thrift" installation, and the "ideal" (at left). Even minimum shown below is more than has been the average in homes of the past, but it does offer circuits for range, water heater, heating system, washer, ironer, refrigerator, radio, lighting and a few smaller appliances

In the ideal home, with 13 instead of 5 circuits besides those for range, water heater and heating, look what more can be sold to such a home in both major and portable appliances, lighting, heaters and radio sets! Copies of these charts showing four degrees of electrical living are available from Westinghouse so that you can show your customers and thus help tell the public why it needs Adequate Wiring

ELECTRIC

Model F56PC. Has 16" oven, three Kloz-Koil or Dura-Glaz surface units, 6-qt. "Side-Heet" cooker, three utensil storage drawers. Smokeless, porcelain broiler pan. Signal light for surface units — illuminated oven dial—appliance receptacle — and combination timer-notifier clock. Cooking top is 38½"x22"x36".

GAS

Model LN6J6. Has 16" oven with dependable automatic control. Drop-front, drawer type, broiler. "Hi-lo-reflex" burners with 2-position gas cocks and automatic lighter. Two utensil storage drawers. Modern light and condiment set and notifier. Porcelain enamel exterior finish with chrome and white plastic trim. Cooking top is 38½"x22½"x36".

First Choice of Good Cooks for Three Generations

RANGES AND HEATERS

Monarch-Paramount

COAL · WOOD, ELECTRIC, GAS and COMBINATION RANGES

MALLEABLE IRON RANGE COMPANY

3917 Lake Street Beaver Dam, Wisconsin

Regardless of your local fuel service or your customers' preferences, this MONARCH twin line of gas and electric ranges fills either need. Both are equipped with fuel-saving features and practical conveniences. Full porcelain enamel heavy steel parts encase the sturdy welded inner body construction. One-piece cooking tops, large capacity ovens, and modern chrome trimmings add plus-quality to these ranges. Both lines are built to the same high standard of workmanship that has identified MONARCH-PARAMOUNT merchandise for half a century.

Lighting for Store and Home

Dealers and lighting men will find hints of important trends affecting merchandising in these IES Conference presentations

LAST month, ELECTRICAL WEST printed reviews of school, street and other lighting papers presented at the recent IES regional conferences. (See December 1946 issue, p. 61). Space was not available for all of them and the remainder of such talks and the discussion of interest following them is published here. This part deals with light for merchandising and significant trends in home illumination by national authorities on these subjects.

For Merchandising

RESULTING from a study developed jointly by Sylvania Electric Products Inc., and the R. H. Macy & Co., in New York City, William F. Rooney of Sylvania said, an approach was made to lighting for merchandising from the standpoint of the store itself and its customers. It was sought to answer these questions: (1) what do customers look for? (2) what does the merchandise look like? (3) how does the interior look? (4) what related factors affect lighting design? (5) what are the elements of the store lighting system?

The answer to the first question divides itself into three general classes of merchandise: (a) Impulse items, grouped around a dollar or less in price which must be attractively displayed so that the woman shopper seeing it and having a spare dollar wants it and takes it. (b) Utility items, or shoppers items, and necessities at large which the woman shops for. This is the big volume business. (c) Prestige goods, or high style or class goods, the leadership items. Here the store puts its major effort into atmosphere.

To answer the second question, studies were made of the appearance of fabrics, textures of merchandise of various kinds under diffused lighting, direct lighting, lighting from various angles, balancing the lighting in showcases to the lighting outside so that the goods look the same and have the same appeal.

Then tests were made in the home of the appearance of merchandise under home lighting conditions to determine what causes returned merchandise.

The third question, that of the interior of the store, caused numerous experiments under actual conditions. Studies of various types of stores and kinds of merchandising were made. Some of these were found to be overlighted or lighted in too great contrast to the general surroundings. Often selection areas were found to be wanting in the necessary lighting to make proper selection of goods.

Consultation with architects then took place and models were made to try out various patterns of lighting fixtures so that they would harmonize with the interior design of the store.

This led to experimentation in devising a wiring grid which would allow any pattern of fixtures and still permit changes to be made in the future without too great a disturbance to the store or too great expense.

Factors affecting lighting design were studied, such as brightness, color, form, walls, ceilings and floors. It was realized that the floor becomes a part of the background yet maintenance has to be considered on light finishes of floors and walls.

Out of all this came a general pattern. It was that each store must have a complete system composed of four elements: (a) general illumination, (b) accent lighting, (c) showcase illumination, and (d) wall display lighting. "Such a system would have a degree of flexibility needed to meet the merchandising demand today. The light sources used for each of the four elements can best be decided by the particular requirements of the lighting project. Many sizes, shapes and brightnesses of both incandescent and fluorescent lamps provide all the tools needed for the design of any store lighting system."

Rooney concluded with the admonition that a lighting engineer should make a more professional approach to the practice of the art of lighting because the solution of many of the tricky problems of merchandising involves the creation of atmosphere. Use of foot-candles and other engineering yardsticks is not sufficient. The industry must stop selling fixtures, lamps and foot-candles and approach store lighting from the aspect of its display value and its merchandising appeal.

Store Fixtures

BRIEFLY stating the same premises that are arrived at by Rooney in his paper, F. C. Winkler of Westinghouse Electric Corp., begins there and goes into the design of a suitable fixture to serve the needs. The paper deals only with general store lighting, not with show case or window lighting, or other special lighting effects. On the premise that there are 2,000,000 stores needing better lighting and that in lighting these there are two obligations, one to the store owners and the other to the customer, he points out

William F. Rooney, Sylvania expert, showing the appearance of the same colored fabrics under various light sources, incandescent and fluorescent

Unretouched photograph taken November 1946 at Boston, Mass.

Each of these BENDIX washers has done 100 years of service

THESE BENDIX AUTOMATIC WASHERS were recently decommissioned after having done more than 320,000 washings in 44 months at the Coast Guard Academy, Groton, Conn., and the Submarine Base, New London, Conn. *Each* machine averaged between 15,000 and 17,000 washings! And they're still in fine running order!

TRANSLATED into terms of family use—say three washings a week—each of those twenty Bendix washers delivered a century of service in that 44 month period. And you may be sure nobody babied them—they washed everything from dungarees to skivvies . . . efficiently . . . automatically!

WHEN YOU SELL a Bendix, you're selling *proved* dependability in automatic washing. You're offering a machine with a nine-year record of performance, not only in spectacular cases like this one, but—what is just as impressive—in a half-million homes, where the Bendix *earned* its position as the World's Most Wanted Washer.

BENDIX HOME APPLIANCES, INC., SOUTH BEND, IND.

BENDIX
automatic
Home Laundry

the need for illumination that will show the merchandise, be inviting, create a pleasing atmosphere in which to buy, and which will permit the quality and color of the merchandise to be appraised by the purchaser.

The illuminaire to serve these purposes must have a logical design, be good looking and yet simple. It must not attract attention to itself and away from the merchandise.

Acknowledging a trend toward fluorescent and yet with the need for incandescent to give accent lighting, Winkler declared that the question of maintenance must also be considered, both for the replacement of lamps and ballasts, and to provide easy access for repair and replacements. He then presented a chart which analyzes the various types of commercial fixtures and finds none to fit just the needs of a store. Then, taking the industrial type of luminaire, which proved so satisfactory for lighting in war plants, he makes adaptations to it in a theoretical design which will allow some spill light to reach the ceiling and yet give lowered direct illumination downward for the merchandise areas. For emphasis lighting he designed a device for two swiveled sockets at each end of the unit or in such quantity as required. In these, incandescent spot or flood lamps can be employed to give a special lighting punch, and the swivel sockets make possible a directional beam.

F Lamps and Color

IN reviewing the highly technical paper, *Practical Color Harmony with Fluorescent Light Sources*, by Robert Russell Wylie, Rooney made no attempt to go into the highly technical phases found in the paper, but to translate the material into practical application. He made use of a color box at the Seattle meeting to illustrate the affect of incandescent and fluorescent light sources upon the same colored materials, differentiating between the appearance of the materials under the standard 3,500° Kelvin light, and the new 4,500° K. The paper itself presents a scientific approach to the development of color harmony with fluorescent and other light sources, reviewing the familiar relations between spectro-photometric measurements, the C.I.E. color system with the existing relationship between this system and the Munsell system.

Rooney pointed out that color is light and the color sensation is a form of light sensation in the eye. In dealing with color he reminded that one dealt both with light in color of light and in light reflectance from pigment. Fluorescent lighting, he pointed out, is a tricky light source, it is deficient in many of the color bands. Incandescent, on the other hand, is too rich in yellows and reds. Even daylight, he reminded, is composed of all degrees of white light depending upon the season, the region and the climate. In general, he advised the use of colors under fluorescent lighting which are to be found in the fluorescent light source and avoidance of those which are lacking.

Light and Form

AT Seattle, Rooney also reviewed the paper by J. C. Kromhout, whom he explained is an architect and has made an architectural approach to the subject of light and form. Kromhout maintained that it is important for the illuminating engineer to visualize a lighting installation as an architect or designer sees it, rather from the act of drawing or composing. The engineering is more like the sheet music than the symphony itself. All elements must be related in the picture created for the eye because it is impossible for the eye to divorce the object from the background. He urged that engineers think in three dimensions rather than in their customary two dimensions.

Thus, he urged the necessity of getting back to the characteristics of the lighting tools that are employed. Fluorescent he characterized as a mist of light and much more difficult to control than the directional incandescent.

Another consideration is whether the fixtures fit in with the interior. A fixture is a machine to give light, and too often does not fit the design itself.

Discussion following the reading of these papers brought out some interesting points. For instance, H. L. Gardner, Frederick & Nelson's, Seattle, said that it is no secret that no merchant buys fixturing as such. He plans to depreciate the fixturing investment over ten years or so, and expects to move displays and fixtures frequently, often moving the entire department. This poses a problem for the designer, whoever he may be. He must provide an installation which will permit this ever changing of the merchandise layout. Thus, general lighting should really be general without regard to the merchandising fixtures. The maximum of flexibility must be provided for accent lighting or combinations of direct or indirect as desired.

Lyman Day Morgan, Pittsburgh Reflector Co., added that it was necessary to use both incandescent and fluorescent to furnish the dark reds and browns that are missing from the fluorescent spectrum. For a proper color evaluation it is impossible to use straight fluorescent alone, and it is not essential to combine the two in one fixture. He also said that accent lighting should not be fixed, but the building should be provided with sufficient wiring so that the display department can install spots and floods wherever wanted immediately. Another observation he made, was that, where wide window expanses are used, more illumination should be provided in the store near the street than at the rear of the store because of the need of the pupils of the eye to adapt quickly to the interior after coming from a more brightly lighted outdoors.

George Boyd, Westinghouse, was of the opinion that all approaches to lighting should be from the standpoint of those who buy and those who sell, and that both have different psychological and physiological viewpoints. The standard designs of the past can now be buried, he said. He was of the opinion that some geometrical ceiling patterns could be used with good effect for atmosphere or to draw customers to certain areas.

Architect Decker said he preferred indirect illumination for store lighting, and asked how much the eye could stand in the way of intensities. Rooney answered that lighting for impulse buying is rated at about 60-75 ft. candles, general illumination about 40-50, and atmosphere lighting 20-25.

Residential

HOW to obtain the values set forth in the residential lighting standards of the IES was the subject of the study of *Illumination and Brightness in Residential Interiors* by E. W. Commery, General Electric Co., Nela Park. While the Society published recommended practices for home lighting and technical committees also published reports on performance and equipment, it is difficult to realize the difficulties that are met in trying to obtain the standards. It is easy for the committee to say that there should be 50 ft.-candles for general illumination but much more difficult to obtain and have the user like it.

Home conditions are more critical than in any other field. We live more physically and intimately with the lighting equipment, the ceilings are lower, the fixtures are more in evidence. Therefore, people resist the increase of light and fear that this will commercialize or make artificial the interior of their homes. This reluctance on the part of the user is a very complex thing. The committee is now trying to find out why it is and what makes it so.

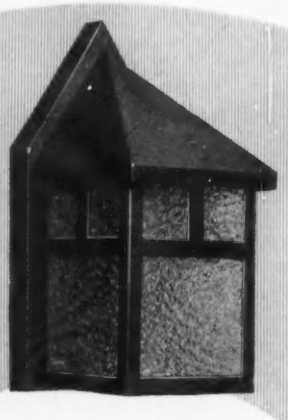
WANTED for homes

Shown in this advertisement are four fixtures of almost universal usefulness—from the latest Virden productions.

We like to believe that applications for these good fixtures are so clear and practical that every lighting man will see instantly how Virden Values open the door to opportunity everywhere.

Available now. See your Virden jobber.

Lantern No. 277



No. 612
Pressed Glass
for General Use

Bent Glass
for Bedrooms
No. 415

VIRDEN VALUE

Drum Type
Kitchen
Unit

THREE SIZES
V-506, 1 light
V-508, 2 lights
V-510, 3 lights

John C. Virden Company • Cleveland, Ohio

Member American Home Lighting Institute

For one thing we do not have the means for creating washes of light to reduce these various areas to relative brightness that are comfortable. The home must not suggest public places in the work world. Style is also a factor. Therefore, in this paper some proposals are made to rationalize the situation with how people live.

An analysis is made to find what is the usual visual task and how can the task be brought into such a condition that it is easy to see. Ingenious charts are worked out to show three zones. The first is the central field of vision, where the person can get the recommended values for the task from portable or other light source. Second is the immediate surrounding area, which it is important to bring into its proper relationship of brightness if a person is to be happy with it. This usually involves the floor covering when a person is seated with a book, and would call for lighter floor coverings and more general illumination. The third is the general surroundings, usually in the upper level of vision.

Ideally, it would be best to get the brightnesses the same in all three zones. This is difficult to do and quite impracticable. One would not want to live in such conditions even if the logic of it was perfect. It becomes a matter of how far we can depart from the ideal and yet get comfortable seeing.

The greater the difference between the first and second zones, the quicker a person rebels. One must keep zone two not brighter, but not less than one-tenth as bright as zone one. Zone three should have no brightness greater than in zone two. Commery even recommended a lapboard of light-finished material as an expedient to fill zone two.

In the kitchen the work surfaces around the range and sink are usually in zone two. What a person is doing, such as cleaning vegetables, is in zone one. Cleaning of leafy vegetables and removing the dirt from them is one of the most difficult seeing tasks there is. To raise the level of light for such a task would make surroundings intolerably bright.

In remodeling the lighting institute at Cleveland, an attempt was made to round up some of these values. An explanation was made of some of the rooms and how they are lighted to obtain the different values. In the report he also recommends that accounts of installations be furnished with brightness readings so that they will have meaning to future readers in comparison with the brightness ratios obtainable at any future time.

In the institute living room, a wash of light is provided on the walls by means of an inset trough in the ceiling,

Miss Rae Jackson of B. C. Electric gave the Seattle conference its international flavor when she told how IES data is adapted to home lighting problems that women bring her

nineteen inches from the wall, and equipped with a slimline lamp, in front of a parabolic reflector which directs the illumination evenly over the entire wall. Other areas needing high-intensity illumination are furnished it by means of inset spot or flood lights, in a simple device at the ceiling, designed for easy access for relamping.

A study also was made of coves, since so many inquiries had been made concerning cove lighting. The ordinary cove is difficult to use in a home, he said, because the ceiling is too low and the effect is not pleasant. A cove was designed in the institute to overcome this difficulty and pictures of it were shown in this paper.

Treatment of a study room in the home was also considered and brightnesses in various portions of it are related.

The third part of his paper, he explained, deals with the problem of glare from glossy surfaced papers. Proposals are made of a system to take into account a factor of specular reflection.

Discussion began with a report from Miss Rae Jackson of B. C. Electric Co., in which she related what the company does to apply the information relative to home lighting from various sources, and to disseminate the information among the general public. Very little has been done for the past seven years since Canada has been at war, she said, but now they can begin to think of home construction and of introducing modern lighting ideas in home building. She spoke of the methods used to spread such information and then cited some of the limitations and difficulties encountered.

The trend toward lower ceilings was one of the problems because, to get a better distribution of light, higher ceilings are needed. The commercial equipment available, while it gives a good light distribution, is not applicable to home use. The texture of the glass does not always blend with home furnishings.

She suggested that a test room be established, and that all ideas for lighting it be made available to those in allied fields, such as paint, glass, home decoration, etc. The problem of lighting existing homes, however, is one which calls for the greatest ingenuity.

Dorothy C. Constans of Frederick & Nelsons declared that, while she herself was willing to accept modern ideas and methods, frankly she had found the Mrs. Jones who comes to buy at the department store has an aversion to the latest things on the market. Decorators have a tendency to reach for these new things, but they have to adjust to Mr. Chippendale, Mr. Adams, and others of the old school.

Mrs. Jones is somewhat guided by her husband's tastes and has a great respect for traditional furniture and forms of the past, and then there are financial considerations. She has to meet the situation. She felt there were too many quacks in the business who are making all kinds of recommendations that are not sound.

Another thing, she said, all women consider themselves "born decorators." She felt that there should be better education on decorative ideas in the schools. The whole problem would take a great deal of tact and patience.

Rooney commented that Al Powell of General Electric some years ago had made a very pertinent statement. "What would Chippendale have done if he had had the tools that we have today?"

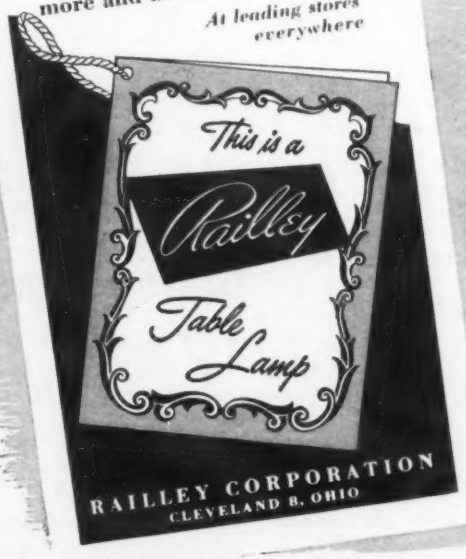
Commery retorted by admitting that the residential field cannot stand the financial load of developing it. He felt that homes should have a reasonable number of fixture outlets and that gradual improvement could be brought about by replacement of fixtures one at a time.

Harry Lion, a fixture designer, said that he had just been asked by the engineers "Can you design a Chippendale fixture?" to which he had answered, "Not with a four-foot fluorescent lamp." He thought that the very limited fixture allowances for home lighting, and the attitude of the average decorator of "I hate fixtures" were great obstacles. One of the worst difficulties is to get people to forget the original modes of light, such as

And Better Light, Too

There's more than beauty in Railley Table Lamps. Railley's exclusive wide-angle lighting lowers the light source, gives more and better light.

At leading stores everywhere



RAILLEY TABLE LAMPS *are making News!*

• More new Railley Table Lamps give you still greater variety of smart lamp fashions at popular prices. Latest is this handsome new lamp of brass in polished brass or bronze type finish, with shades of maroon or forest green. And, of course, with the exclusive Railley Deep-Set socket for wide-angle lighting, giving greater light spread and light intensity.

GOOD NEWS TO 30 MILLION AMERICAN WOMEN ...AND TO YOU

Twelve leading women's service magazines carry this Railley advertising...to three out of every four American families. The most intensive and extensive advertising done by any lamp manufacturer, it is helping to build Railley brand consciousness among *your* customers.

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new ATTIC FAN TIMER by Paragon

HERE'S a new member of the Paragon family . . . the AF Series for timing attic and window fans.

Entirely new in design, this timer is offered in two time ranges, 0-10 hours and 0-20 hours, each fully adjustable to any position on the dial . . . a real convenience for the user.

Equipped with a quiet Telechron motor and an improved switch, the timer is rated for high capacity, and will handle a ½ HP motor. Beautifully finished drawn aluminum case, anodized, with dial and pointer protected by clear Plastacele.

Underwriter approved, all electric, no springs, mounts easily to Handy box or single gang switch box, or may be surface mounted with conduit connections into the bottom of the timer. The setting may be changed at will without harming the instrument. Timer motor runs only when timer is actually in operation.

Get your orders to your jobber—now and start planning installations early. Complete data sheet on request.

AT ONLY $9.75 AN OUTSTANDING VALUE

PARAGON ELECTRIC COMPANY
1606 Twelfth Street
TWO RIVERS, WISCONSIN

Paragon Two Rivers WISCONSIN
BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1905

candles, which are associated with the period, yet in some interiors a candelabra is needed because it belongs to the room, if that room is of the period when candles were used.

Miss Constans then commented that coves would not hurt any interior but that it was hard to get a client to see that point of view and also to get the decorators to do so. She was of the opinion that, if the department stores in their model homes demonstrated good lighting methods, it would have a great effect on educating the public.

William Gordon, Seattle Lighting Fixture Co., felt that educational work had to touch many places that it had never reached. It had to be brought to the electrical contractor, to the interior decorator, to store lamp departments, to equipment manufacturers. He said that he hoped we had passed through this era of "decorating with light." He asked what could be done with the large number of homes already built and very poorly lighted. Commery answered that the only thing that could be done with existing homes was to make intelligent use of portable lamps.

Mrs. Virginia Farrar, a color consultant, said that she had found success in using fluorescent light with colors which are to be found in the fluorescent source itself. In other words, if the pigment contains the same color that the light emits, that color will be intensified by the fluorescent light, and those color's which are lacking from the fluorescent lamp, if they are avoided, will not be missed. In the use of spotlights, she said, if the elements around the spotlighted place as well as the background, reflect warm colors, then one gets a pleasing effect rather than harsh shadows, with the use of a spot.

K. F. Sutherland of DuPont spoke of the research done by the paint industry in the development of tones and colors for home use. He recommended thinking of colors in the design of the lighting installation since one can change the appearance of a room by the choice of color.

Asked what fading of colors might be expected from fluorescent lamps, and particularly the 4,500 white lamp, and whether salt in the air caused faster fading, Rooney said that it was a matter of arithmetic and could be computed on the basis of the intensity of the light times the exposure time. It was impossible to generalize since some dyes were more susceptible to fading than others, and it was true whether it was daylight or other types of lighting. The wave length had little to do with it.

The complaint of more fading under fluorescent probably came because the general level of illumination had been raised and there was longer exposure.

Commery declared that they had thought the 4,500° would be more satisfactory because it provided less distortion, but where it had been worked with it was still considered too cold. He felt that the 3,500° light was most desirable, since it provided greater warmth and that, where it was used outside of kitchens and bathrooms and handled properly, people looked well in such rooms.

President Hardacre said that he hoped the answers to many of these questions were not too far distant since the committees of the IES were working on these problems. He felt that much could be done by small groups or by individuals and contributed to the general knowledge accumulated through the society. He suggested that study clubs in chapters assign themselves such tasks and contribute what knowledge they could.

F. E. Gilbert Jr. of Sylvania concluded both San Francisco and Los Angeles conferences by demonstrating the new speed flash lamps for photography

Frank Anderson of Westinghouse Lamp Division, concluded by commenting that color temperature acceptance was a matter of evolution such as the lines of the automobile had been. Many would not accept the radical designs when they first occurred, and it may be too much of a jump for the public to accept a 4,500° light when they are just becoming accustomed to the 3,500°.

Glare Ratings

IN PRESENTING the paper by Ward Garrison and Phelps Meeker, *Further Data on Glare Ratings*, E. W. Commery simplified the technical nature of the paper for the conference. He skipped the intermediate portion of the paper, in which the mathematics are presented, but gave the principles upon which it is based and discussed its application in the future.

There has been needed some means of appraising lighting systems from

the standpoint of the discomfort glare that they produce. The engineer has needed some means of giving the glare range a numerical value, and of being able to appraise lighting systems or design them with a conscious knowledge of the glare that they will produce.

In arriving at standards, it was necessary for the authors to consider actual conditions, while seated and standing, and at different eye levels. The seating applies for reading in schools, auditoriums, offices, etc., and the standing levels for general illumination in stores, etc.

The glare factor is determined in comparison of a 1-in. patch illuminated to 1,000 ft.-lamberts elevated above the line of sight ten degrees and surrounded by a field of brightness of 10 ft.-lamberts. The authors also determined that when you get to 15 such units you come to the edge of the threshold of comfort or discomfort in lighting. It was recognized that some higher values are permissible in stores where normally persons are not seated for a long working period.

The paper makes comparisons of glare where the fields surrounding the immediate glare source are reduced or increased, or where the glare source is enlarged.

Further work on this subject is developing a series of tables by which an engineer will be able to plot in advance a relative glare factor or rating for an installation, whether the lighting units are placed endwise or crosswise and based on the number in the room and the size of the room and its height and finish.

● WHEN the chairman of the board of so big a concern as General Mills, Inc. makes the introduction of an electric iron his personal responsibility, that's news. James F. Bell, chairman of the board for General Mills, and other executives did just that in a series of unique meetings of that company's stockholders, two of which were in the West at San Francisco and Los Angeles. In explaining the company's operations both personally and in a moving picture "stockholders' report" Bell told how, as an outgrowth of employing its staff of machinists and technicians to make war products, General Mills had followed its research where it led and was introducing first a new and superior electric iron and later would have a pressure saucepan and a coffeemaker and other appliances. These will be sold through retail and regular appliance distribution channels, protected by fair trade agreements and backed up by advertising and visual training sales aids. The iron will be available in early spring.

NEW—POWERFUL ADVERTISING CAMPAIGN PROMOTES *LITTLE GIANT* SALES!

The powerful advertising being released for the promotion of Little Giant Tray Washers will make greater profits for dealers . . . and there are lots of additional promotion material and dealer sales helps on the way, too. We are looking ahead for both your future and ours and paving the way for constant sales that mean constant profits.

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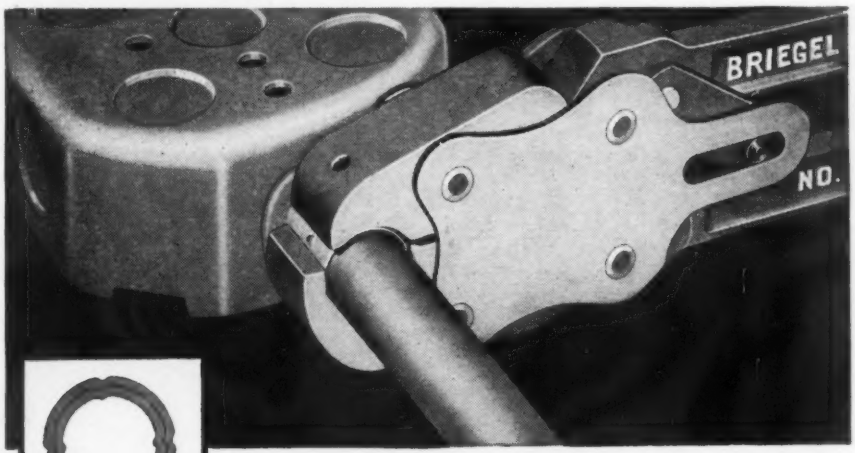

Cross section Showing Indentations.

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Two Squeezes and it's Set

TWO QUICK SQUEEZES give you Finer, Faster Conduit Connections. B-M Fittings do away with the twisting, turning and tightening of nuts and save you valuable time and materials. Then too, they are stronger, neater and much easier to work with in tight places. Start using B-M Fittings today. Have more satisfied customers—more profits from each job!

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NEWS of the industry

GORGE PLANT EXPANSION SCHEDULED BY SEATTLE

Field work and specifications for expansion of Seattle City Light's Gorge plant on the Skagit River will be financed by a $240,000 appropriation from surplus City Light funds, following approval by the Seattle Board of Public Works. Estimated to cost several million dollars, the expansion will double plant output.

In asking for the preliminary appropriation, Superintendent E. R. Hoffman said the project could be carried on simultaneously with construction at Ross Dam, 14 miles up the river. He pointed out that two years would be gained by this procedure, as compared with deferring the Gorge plant enlargement until after the Ross power house has been built.

Cost per kilowatt and kilowatt-hour of the proposed addition will be reasonable, Hoffman stated, although new and existing generators will operate at reduced head until the dam at the tunnel intake, two miles upriver, is constructed. With $440,000 annual carrying charges for interest, depreciation and operation, the 40,000-kw. added generation at the Gorge plant, with its present head of about 270 ft., would cost $11 per kilowatt-year, as compared with $17.50 for purchased power.

The city council recently approved City Light plans for sale of a $6,500,000 revenue bond issue to finance construction at Ross Dam and in the Gorge power house and refund a $1,861,000 issue sold in 1942. The $6,500,000 issue will be part of an $18,500,000 issue authorized in 1930 for Skagit construction. A total of $11,500,000 has been sold.

Jury Puts $670,070 Valuation on Pacific's Klickitat System

A $670,070 valuation was placed on Pacific Power & Light Co.'s Klickitat County system by a federal district court jury at Yakima, Wash. Action was instituted by the Klickitat County PUD, which wishes to take over the properties.

Power company witnesses set a value on the properties of between $940,000 and $1,000,000. PUD appraisals ran between $460,000 and $498,000. The jury deliberated three hours on evidence submitted during the eight-day trial.

Following the jury decision, Lee Darland, PUD commission chairman, announced plans for a county-wide rural electrification program to begin next spring. The commission has purchased $358,000 worth of equipment, and it is now ready for delivery, he said.

Northwest Utility Merger Given FPC Approval

Merger of Northwestern Electric and Pacific Power & Light companies was approved last month by the Federal Power Commission, and will be effective upon approval by the utility commissions of Oregon and Washington. Under the merger agreement filed last July, Pacific Power & Light Co., the surviving corporation, will assume all liabilities of both companies, issuing new securities to retire those outstanding.

River Navigability at Issue In Montana Hearings

With testimony centering on navigability of the upper Missouri and its tributaries, FPC began hearings at Helena, Mont., recently, to decide whether or not Montana Power Co. must have federal licenses for operation of its seven hydroelectric plants near Helena and Great Falls (EWEST, November, p. 106).

On the opening day Trial Examiner Glen R. Law stated that the commission's case would be built around the contention that the Missouri is a navigable water of the United States; that even if the seven plants are not located on a navigable portion of the river, they affect navigability downstream; that some of the power company installations are on land in which the United States retains an interest, and that all the developments from Hebgen Reservoir on the Madison River to Morony Dam are operated as a unit and, if one requires a license, all should come under that classification.

J. E. Corette Jr., power company attorney, moved for dismissal of the entire proceedings, declaring that, if the commission believes the company is illegally occupying river sites, it has adequate opportunity to present its case in court, either by applying for an injunction or by directing the attorney general to prosecute in district court. The dismissal motion was sent to Washington for decision, the hearing continuing in the meantime.

COLORADO POWER COMPANY MAKES FRANCHISE PROPOSAL

In asking for a 20-year franchise renewal in Denver, Public Service Co. of Colorado has presented the city council with a proposal which includes reduced consumer power rates, a gift to the city of $1,000,000 worth of new street lighting and a substantial increase in its annual franchise tax.

John E. Loiseau, Public Service president, announced also that, if Denver voters approve the 20-year franchise, a $27,000,000 improvement and expansion program will be undertaken.

Principal features of the proposed new franchise include:

1. Rate reductions on electricity calculated to save Denver citizens $1,250,000 annually. The new rates would figure about 13% lower than those now in effect.

2. An annual franchise tax of about $375,000 as compared to the present $60,000. This is to be based on 3% of the company's gross.

3. A street lighting modernization program to give the city about 2½ times more street lights, with the cost borne by the company. A 10% cut in street lighting rates goes with this.

Besides these main features of the proposal, Public Service agrees to purchase all hydroelectric power generated by plants that the city may build in connection with its water supply. It is agreed also that when Colorado-Big Thompson power is available, the company will pass on to customers any savings it might make through purchase from the government plant.

It is probable that a franchise election will be held in February. Expectation that the Big Thompson project will be ready to deliver maximum power by 1955 last month was causing some support for a five- or ten-year franchise. The company contends, however, that it could not finance the $27,000,000 expansion program on the short-term franchise.

● AN ORDER for 110,000 pounds of wire and 500 transformers has been placed by the Eugene (Ore.) Water Board, which reports a 52% increase in the number of domestic customers using electric ranges, a 29% increase in kilowatt-hour consumption by all general customers and a 32% increase in kwh. use by residential customers during the first nine months of 1946.

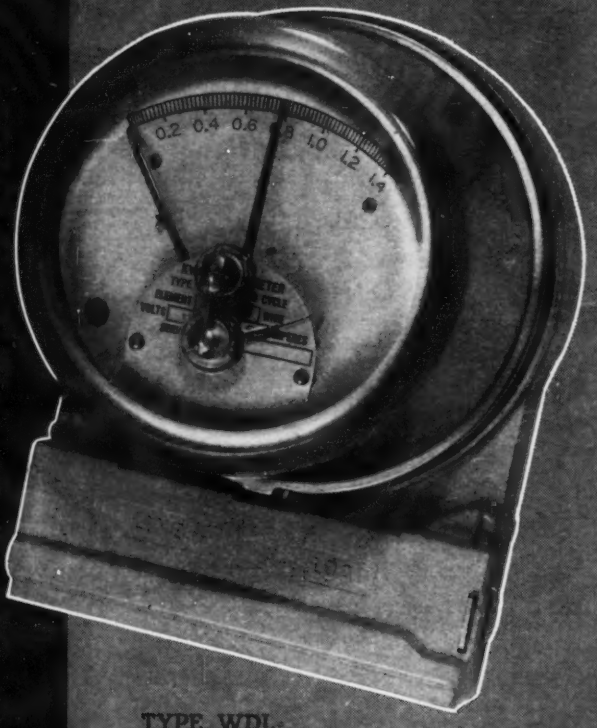
TYPE WDL: *measured demand* FOR ADJUSTED POWER FACTOR RATES..

The Sangamo Lincoln Type WDL thermal demand meter provides, in a single unit, economical and convenient measurement of demand adjusted for power factor. This meter is made with a self contained transformer to provide the angle of lag to meet your system requirements.

Except for the special transformer, these meters are identical in construction to the standard Sangamo thermal watt demand meters. If system conditions change a new angle of lag can be obtained by the simple replacement of the transformer.

With a fixed angle of lag the meter automatically measures for each unit of KW a fixed proportion of RKVA, as determined from the relative cost of the two components for your system. By indicating a single quantity adjusted for power factor, this meter is ideally suited for use with a coordinated rate schedule utilizing the "Billing Unit".

With these units the measurement of demand adjusted for power factor can be accomplished at very little more than the cost of KW measurement. Discussion of your requirements for demand metering equipment for special rates or billing procedures is invited.

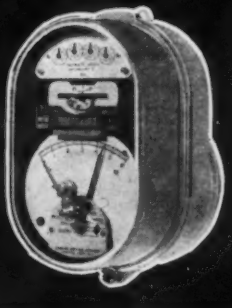


TYPE WDL-

Sangamo-Lincoln thermal Type WDL Demand Meters may be supplied in both A and S construction for any singlephase or polyphase circuit for measurement of demand adjusted for a predetermined power factor.

TYPE JWL

Type JWL meters combine two standard meter elements, the Sangamo Type J watthour meter and the Lincoln-Type WDL demand meter, in a single unit. They are made in A and S construction for singlephase services.



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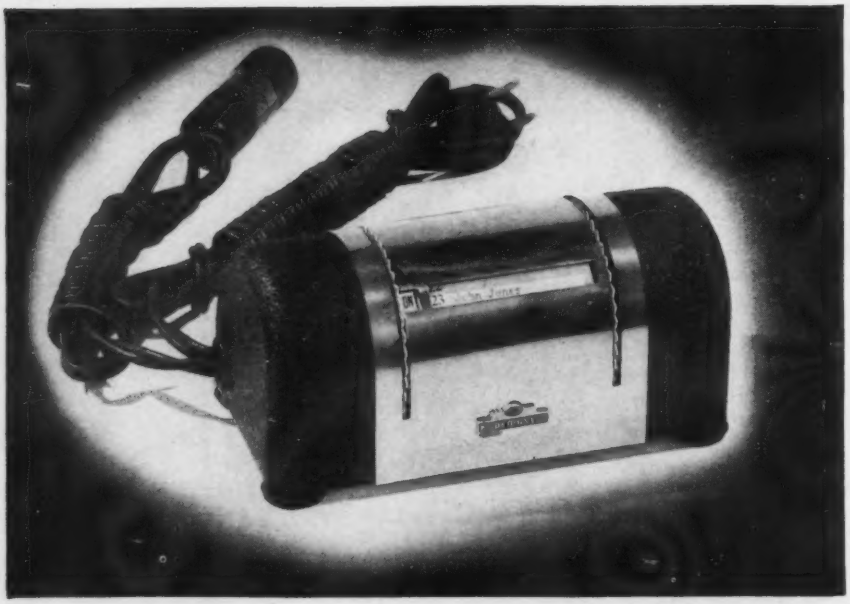
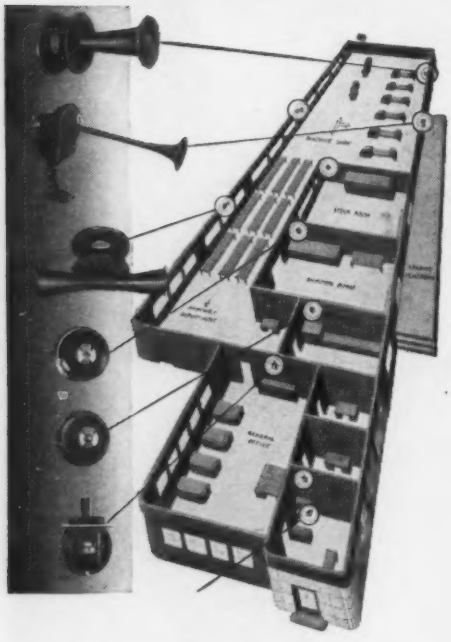


FARADAY KODEMASTER

Gets the right man in a jiffy!



A long distance call—an important conference—can't wait for the operator to telephone all around the plant. Time is valuable—too expensive to waste! Kodemaster will get the right man in a jiffy—only a few seconds and its message reaches every nook and corner of the plant and the man is located.

Every factory large enough for a telephone switchboard needs the efficient Faraday Kodemaster. It's the ideal system for locating individuals in a hurry—up to 30 different code signals.

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UTAH POWER STARTS IDAHO CONSTRUCTION PROGRAM

Utah Power & Light Co. has started a $600,000 construction program in the Upper Snake and Lost River Valley areas of southeastern Idaho. As announced by R. I. Woolley, Rexburg, Idaho, division manager, the company will:

1. Build a $340,000 substation at Goshen, tapping the 161,000-volt line operating between Grace and Anaconda, Mont., and the Northwest power pool interconnection.

2. Construct 32 miles of 44,000-volt line between the new substation and Rigby substation, approximate center for electric service in the Upper Snake area. This phase of the program will cost about $150,000.

3. Make improvements costing $25,000 at Rigby sub.

4. Build from 17 to 25 miles of 44,000-volt line from Roberts substation to Owsley at a cost of $85,000. This will relieve load on the existing line between St. Anthony and Arco and improve service in the Big and Little Lost River, Mud Lake and Dubois areas.

Eventually the company will interconnect the Goshen substation with Idaho Power Co.'s 132,000-volt line.

The 32-mile line northward from Goshen will be of standard wood pole construction.

Arizona Commission Asks FPC to Make Rate Survey

With constitutionality of the $50,000 legislative appropriation for a survey of Arizona power rates (EWEST, November, p. 106) still undecided, Gov. Sidney P. Osborn last month secured a state corporation commission resolution requesting FPC to make the study. The resolution passed two to one, with Chairman Wilson T. Wright opposing.

The action was taken following an opinion from the state attorney general, John L. Sullivan, advising the commission that it has full authority to incur obligations and to expend the funds appropriated to it.

FPC men were in Phoenix nearly a year ago to start the rate survey (authorized by the state legislature) but were withdrawn when effort was made to subject the appropriation to referendum vote—a procedure blocked by supreme court decision. Last month FPC Chairman Leland Olds informed the Arizona commission that he wanted his legal staff to study the Sullivan opinion before further steps were taken.

DEPRESSION IN '47?
...controls can bring one

IT IS CONVENTIONAL for the American business man, who values freedom, to protest against government regulation. On this account, many people who do not know the facts in detail are inclined to discount current business protests against the post-war application of wartime economic controls. This is particularly true since in his report for the third quarter of this year, the Director of War Mobilization and Reconversion implied that business is in fine health by remarking that "business profits, after taxes, are at the highest point in history."

In complaining about government controls, however, the American business man is not crying wolf. These controls were an essential war weapon. Now, however, they are contributing decidedly to a twisting and distorting of the American economy in a degree which, if not soon corrected, may well start production and employment down the toboggan.

One general indication of how badly twisted our economic system has become is found in the wide disparities in the amounts by which different groups of prices have increased. Since 1941, for example, farm prices have advanced an average of about 125%. Industrial prices, more tightly controlled than any other group except rents, have increased only about 32%. Meanwhile, straight time hourly earnings of industrial workers have gone up about 60% and the cost of living about 43%.

The advances of individual prices within these groups have also varied enormously. Among industrial prices, that of finished steel has gone up only about 14% since 1941, while lumber has gone up over 50%. Hourly wage rates in the women's garment industry have gone up 116%, while those in the brewing industry have gone up only 33%. That share of the cost of living due to rent has gone up only 4%, while that due to the cost of clothing has gone up over 60%.

Well, What Of It?

At least four things of major importance:

1. Production, under the influence of price control, has been heavily concentrated in some lines to the neglect of others. Result—unbalanced production, unbalanced inventories, and a serious cut in the flow of goods to consumers.

2. More or less uniform post V-J Day wage increases, promoted by the federal government, have imposed a far more serious cost problem on some industries than on others. This is particularly true of some of the most basic industries.

3. While, as a whole, "business profits, after taxes, are at the highest point in history" (due in part to a temporary excess profit tax rebate arrangement) there are enormous disparities in the profits of different industries. Some key industries are making little or no profits.

4. If not corrected, the distortion of prices, wages and production, which has resulted in such a wide disparity of profits, can contribute decisively to a major business upset.

The most striking example of the distortion of production by controls was, of course, that provided by a metropolitan meat famine at a time when beef cattle crowded the ranges. This has now been recognized. But there are many other distortions. Abundance of sports clothes, acute shortage of more essential clothing made from the same kind of cloth. Successive shortages of critically important products like baling wire and nails as the price lid on steel is jiggled first this direction and then that.

Some of these distortions of production are due to material shortages. But a major contributor is uneven application of controls, and the total removal of some while others are held firm. Among the results are bulging inventories of partially completed assemblies and shut-downs while waiting for parts.

Wage Complications

While price controls, unevenly applied, have shunted production first this way and then that, the federal government has further complicated the situation by promoting uniform wage rate increases without regard to varying capacities to pay them. The greatest single contribution to this distortion was made by the President himself. In the course of

unsuccessfully trying to mediate the dispute over steel wages last January he recommended a wage rate increase of 18½ cents an hour. Immediately that increase was accepted by organized labor as par for the first round of wage adjustments, having the sanction of the White House itself. The game then became to beat par.

But the capacity of different industries to pay wage increases varied greatly. During the war some had hiked their pay much more than others. Moreover, in some industries wages are a much larger element of total cost than in others. In 1939 (last year for which figures are available) wages ranged all the way from 2½% of total sales in cigarette manufacturing to 34.3% in hosiery manufacturing and 65.2% (for wages and salaries combined) in soft coal mining.

Under these circumstances, some industries were far less able to meet a uniform wage increase than others. Nonetheless, many of them had uniform wage increases imposed upon them. Then the price lid was held firm. This, coupled with material shortages and production difficulties which also choked output, squeezed the profit right out of those industries.

A Study In Contrasts

Some of the most important industries are making little or no profits while they bump along on a production volume which fails to meet consumer needs and prevents attainment of maximum efficiency. The automobile industry affords one conspicuous example. Another is electrical manufacturing, and rail equipment is yet a third. All of them are crucially important. Many other lines of business, of course, are extremely profitable. For example, the profits of a group of large retail stores were 150% higher during the first half of this year than they were a year ago; the profits of a group of motion picture companies were up 140%.

In the meantime, the workers in some of those low-profit industries are in no bed of roses. The increase in the cost of living since 1941 is now outstripping the increase in the hourly wage rate of workers in a number of industries, where wage rates have not risen as much as the average. On a weekly basis, a shorter work week, with less overtime, has combined with the recent upsurge in consumer prices, to place the living standards of some of these workers below the wartime level.

Such circumstances obviously create pressure in the ranks of these workers for another round of wage increases. But as long as the profit remains squeezed out of their industries wage increases, if any, must be translated either into higher prices, or, if the government sits tight on the price lid, into losses which will discourage production and ultimately cost workers their jobs.

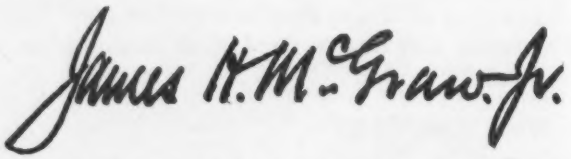
What To Do?

Salvation both for the workers and for employers in the relatively profitless section, a peculiarly important group of industries, must be looked for primarily by increasing productivity, thereby decreasing the cost per unit. Part of this higher productivity can come only from individual efforts of the workers themselves. Another part can come from an elimination of bottlenecks in materials and parts which prevent the labor force from working most efficiently. Only by greater output per man-hour can workers and management solve their common problem.

Until productivity has been thus increased, it is hard to think how the federal government could do a greater disservice both to labor and to industry than to repeat its performance of promoting a uniform national wage increase. With the present distortion of the national economy, some industries might again take such an advance in their stride. With many others it would raise even greater havoc.

While avoiding like the plague promotion of another uniform wage adjustment, the federal government must make it a primary objective to relieve distortions caused by the uneven application of other controls, primarily price control. Nature has given a lift to the elimination of distortions by providing bumper grain crops which should in time reduce that staggering disparity between a 125% increase in farm prices and a 32% increase in industrial prices. But that process must be speeded as a matter of conscious policy. No element of such a policy is more important than expediting the decontrol of industrial prices. Such a course is clearly essential to achieve that balance in the production of materials and parts required for maximum output.

Business and labor both want a sustained prosperity in which all will share. Sustained prosperity can be achieved only if we eliminate the distortions in wages, prices and profits which now restrain so much vital production.



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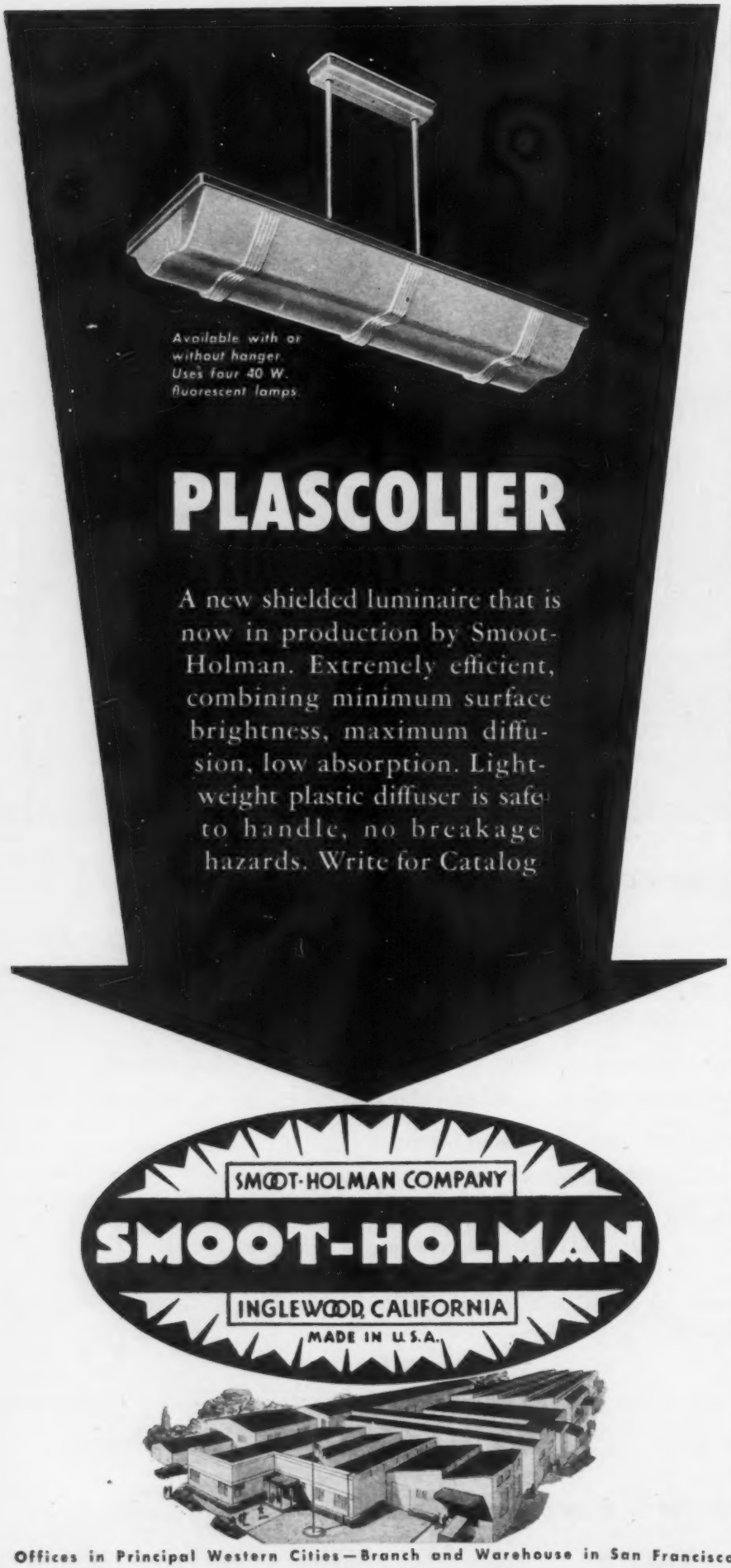
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EQUIPMENT CONTRACTS LET FOR COULEE POWER HOUSE

Contracts totaling $5,737,446 have been awarded for three 165-000-hp. turbines, three 108,000-kva. generators and three governors to go into the now-vacant east power house at Grand Coulee Dam. The three units, plus three being built for the west power house, will bring Grand Coulee capacity to 1,316,000 kw.

The verticle-shaft hydraulic turbine contract went to the Newport News Ship Building and Dry Dock Co., Newport News, Va., for $2,247,531. The $3,367,717 contract for furnishing and installing the three generators and furnishing spare parts went to Westinghouse Electric Corp., Denver. The governor contract was awarded to the Woodward Governor Co., Rockford, Ill., for $122,196.

A $159,000 contract covering three 40,000-kva. transformers for the last of three generators now being constructed for the west power house also has been awarded to the Westinghouse Electric Corp. at Denver.

Other Grand Coulee contracts totaling $2,537,032 were awarded for the building and installation of six of the world's largest electric motors to turn pumps in the Grand Coulee pumping plant. These went to General Electric Co. and Westinghouse.

New Lines to Provide Stand-by Power for Dam Construction

Stand-by power for construction of Davis Dam will be provided over a 28-mile line from the site to Kingman, Ariz., connecting with the Citizens Utilities Co. system. Contract for the 69-kv. line was awarded by USBR to Donovan Inc., St. Paul, Minn., on a $91,969 bid.

A 69-kv. line serviced by California-Pacific Utilities Co. already is installed on the Nevada side of the river. After the river has been diverted, electrically driven pumps will keep the foundation area free from water and, since failure of these pumps would cause costly delays, the stand-by power is a necessary precaution.

The new line will be used to transmit power for use at Bullhead City, home of many workers on the Davis project.

● A $155,653 CONTRACT for a synchronous condenser and control equipment for the Tucson substation at Tucson, Ariz., part of the Arizona-Nevada Davis Dam project, has been awarded to General Electric.

B. C. ELECTRIC REFUNDING PLAN WINS APPROVAL

B. C. Electric Railway Co. has secured approval from the lieutenant-governor-in-council of a $33,000,000 bond refunding plan affecting its power systems. Saving the company approximately $225,000 annually in interest, the new issue will be 20-year first mortgage and collateral trust bonds yielding 3.25% and will be released through a syndicate headed by Nesbitt Thomson, Wood Gundy and Societe de Placements. The bonds to be retired have been paying 4¼ and 4%.

Companies affected by the refinancing are the parent, British Columbia Electric Power & Gas Co. Ltd., whose name will be changed to B. C. Electric Co.; Vancouver Power Co. Ltd.; Bridge River Power Co. Ltd.; Vancouver Island Power Co. Ltd.; Western Power Co. of Canada Ltd.; and Burrard Power Co. Ltd.

Under the new plan, B. C. Electric Co. will handle all matters pertaining to electricity and gas, while the B. C. Electric Railway Co., parent, will continue to direct the transportation business.

Savings will be absorbed by increased labor, materials and other costs, according to company officials.

● WORK on the Bureau of Reclamation's power line from Oroville to Sacramento, Calif., has been started on a force account basis, according to Ben W. Creim, regional power division manager, who said that the method would allow the project to be well advanced by the time materials for completion are available. The 55-mile line is a section of the line from Shasta power house; present bureau plans call for its extension to Tracy.

● COWLITZ COUNTY PUD, Longview, Wash., has rejected as too high bids to rebuild two boilers and combustion chambers in its steam plant. The low bid, $303,329, was far in excess of estimates. PUD commissioners authorized Manager C. T. Hurd to continue studies relative to the redesign and rebuilding of the plant and to consult with H. W. Beecher, Seattle mechanical engineer, with regard to changing the specification.

● IDAHO POWER Co.'s new Vale substation has been completed and the company is building a 69,000-volt line extension from Vale to Juntura and Drewsey. R. D. Jefferson is superintendent of the new station, which steps down voltage from 69,000 to 12,800.

A COOL ELEMENT FOR HOT AIR

Electromode Element Gives Off Heat So Fast It Stays Relatively Cool

The 10 KW model illustrated is for suspension mounting only. Other models 1.5 KW to 7.5 KW arranged for either portable use or suspension mounting.

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A 48-ft. wooden-hull tugboat, designed for maneuverability and heavy weather, was launched last month by Pacific Gas and Electric Co. It will service underwater power lines connecting electric facilities in the Bay Area, and replaces a tug in service for many years. Underwater breaks will be detected by means of short-wave radio tuned to a sound beam transmitted over the cable. At the launching were (from left): Walter A. Anderson and Alfred Christofani, builders of the tug; Norman R. Sutherland, San Francisco division manager of PG and E; Miss Charlene Shear, sponsor; Charles Shear, tugboat skipper; L. H. Anderson, Pacific Gas and Electric vice-president. (Photo by Don Kroch)

USBR Lets Contracts for Anderson Ranch Dam

Southwest Welding & Mfg. Co. of Alhambra, Calif., has been awarded a $683,942 contract by the Bureau of Reclamation to supply penstocks and related equipment for the Anderson Ranch Dam on the South Fork of the Boise River, 40 miles southwest of Boise, Idaho.

The contract calls for delivery within 15 months of one 15-ft. welded plate-steel penstock header, a manifold and three 90-in. diameter penstocks, including flanges and fittings. The header pipe will carry water from the reservoir through the left abutment of the dam into the manifold pipe.

Plans for the multiple-purpose dam call for installation of a power plant with an initial capacity of 27,000 kw. An additional 13,500-kw. unit is to be installed later.

● Allis-Chalmers Mfg. Co. has been awarded a $354,000 USBR contract for three 18,500-hp. single vertical-plate steel spiral casing hydraulic turbines for the Kortes power plant on the North Platte River about 60 miles southwest of Casper, Wyo. The turbines will operate at a speed of 240 r.p.m. under a net effect head of 200 ft. The contract also includes three Allis-Chalmers oil pressure actuator cabinet type governors. The Kortes dam and power plant was the first unit of the Missouri basin project placed under construction.

Washington Water Power Will Remodel Post Substation

The old Post St. substation in Spokane will be modernized by Washington Water Power Co. after 36 years of operation, it was announced by C. E. Cannon, electrical engineer for the company.

The station was placed in operation in 1908 and a good deal of the original equipment is still in use. It supplies electricity to the city's street lighting system, to the downtown underground system and to close-in residential, commercial and industrial areas.

The $75,000 modernization will be directed by R. C. Kelly.

PELTON Turbine for Colombia

Shop View of 13,000 hp. Pelton Impulse Turbine for El Salto plant in Colombia, 1,300-ft. head, 600 r.p.m. The inlet valve is a Follow-Ring Type Gate Valve, Hydraulically Operated.

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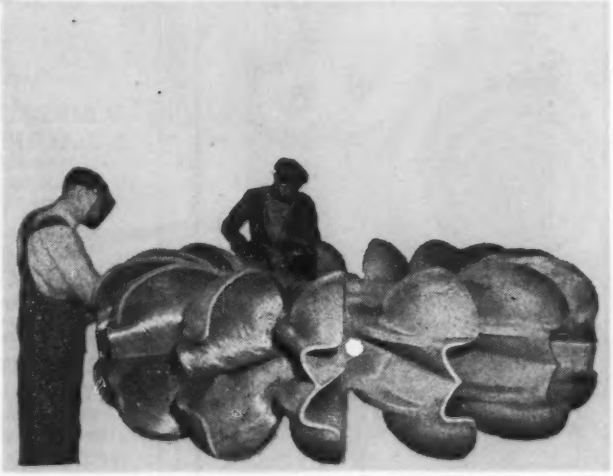
Meanwhile, laboratory experiments still go on to verify the shape and contour of impulse buckets, the curvature of reaction-turbine runners, materials to withstand abrasives in the water, new types of controls, and so forth.

With all of this, the Pelton organization of skilled craftsmen, using modern machine tools, builds the turbines and specializing engineers supervise installation and prove performance.

These are reasons why Pelton Turbines do develop the required horsepower at any given site and do withstand long years of continuous operation free from trouble.



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SEATTLE STILL REFUSES TO BARGAIN WITH IBEW LOCAL

In face of a strike threat, the Seattle city council last month persisted in its refusal to recognize Local B-77, IBEW, as bargaining agency for City Light employees, denying the union's petition for a board of arbitration. Union members voted five to one to strike if their demands were not met.

All nine council members signed a letter to the union, which read in part:

"It is our considered opinion that to grant your request and all similar requests would in effect and in fact change the form of our government from one of constitution and law to one of collective bargaining.

"There is and must be no authority higher or superior to that of the people and that authority can be exercised only through the elected representatives of the people and cannot be delegated. To enter into a contract with a labor union or any other person or organization which would restrict or surrender any part of this authority would constitute a violation of our oaths of office.

"The relationships between an employee and a municipality are different from those between an employee and a private employer. An employee has no right to strike against a municipality. If he is dissatisfied with his relationship, he must seek his remedy at the ballot box.

"At the present time, the council has under consideration the adjustment of certain wages of city employees. It intends to meet in all cases the current and going wage scales of this community, and wherever possible to grant other benefits superior to those granted in many private enterprises."

PG and E Bargaining Agency Up to National Board

Question of union representation for northern California employees of Pacific Gas and Electric Co. last month was referred to the National Labor Relations Board in Washington, D. C.

Announcement of the referral was made by Thomas A. Davis Jr., San Francisco NLRB official, after AFL's IBEW petitioned for an election to determine whether it or CIO's UWU should be bargaining agent for San Francisco and North Bay employees of PG and E. At present, UWU represents workers in the Bay region and IBEW holds contracts for between 5,000 and 6,000 outside that area.

At a hearing in San Francisco, the company requested that, if an election were held, it include all districts.

DISTRICT WILL NOT SIGN BARGAINING CONTRACT

Refusing to set a precedent in the state for collective bargaining by a civil service agency, directors of the Sacramento (Calif.) Municipal Utility District declined to sign a contract with AFL's International Brotherhood of Electrical Workers. The union, bargaining agent for Pacific Gas and Electric employees in the area, sought to continue its representation after the district take over on Jan. 1, stating that civil service "in many instances does not provide the protection it is supposed to."

In answering union demands, district officials assured employees that wages, hours and working conditions would be equal to or better than those in effect under PG and E management, that an extra holiday with pay would be granted and vacation and sick leave allowances would be liberalized. They stated further that the district would make no objection to union membership, would welcome recommendations from employee organizations and would set up a Joint Grievance Committee to consider inequities.

It was pointed out that, strictly speaking, the district would not be the first civil service agency in California to enter into a union agreement, since the Vallejo city council, after consulting with the state attorney general's office, signed with a union representing employees of the city-owned motor transportation system. The attorney general's opinion in that case was that the advisability of such an agreement was the concern of the city council; that the council could not be compelled to sign but, if after negotiations and mature consideration, it believed that such an agreement would best serve the city's interests, there was no legal objection.

Representatives of the Sacramento-Yolo Building Trades Council, AFL, expressed fear that IBEW jurisdiction would exclude their members from district jobs, but stated that the union would not oppose a contract giving its members full protection.

● BOARD of the Washington State PUD Commissioners Assn. has asked its legislative committee to make recommendations on a bill authorizing collective bargaining by public utility districts. The bill was drawn by IBEW and will be submitted to the next session of the state legislature if approved by the PUDs. Also under consideration is a bill with pension and insurance provisions for PUD employees.

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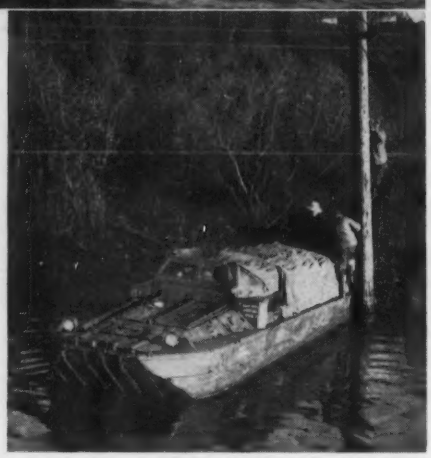

During December floods, Puget Sound Power & Light Co. patroled endangered lines with an Army "duck" borrowed for the emergency period. These pictures show crews at work in the White River Valley south of Seattle. Right, linemen start repairs on fallen wires; above, a pole has been pulled out of line as a house was tipped from its foundation by the impact of the heavy water

Governor Urges Opposition to High Electric Rates in West

Gov. Earl Snell of Oregon has asked governors of other Western states to join him in opposition to "the abortive effort now developing among eastern members of congress to force artificially high and unjustified electric rates upon this area."

The Oregon governor said reports indicate that eastern congressmen are determined that no further appropriations for the Bonneville project will be made "unless there is a sensible increase in Pacific Northwest power rates."

"This," Governor Snell said, "can be interpreted only as an effort to cripple the industrial development certain to come to this area by depriving us of the advantage bestowed so abundantly by nature in an unlimited supply of hydroelectric power."

● To Help Relieve threatened power shortage in Albany, Ore., output of the City of Eugene's 7,000-kw. Leaburg hydro plant will be turned over to Mountain States Power Co. for a three-month period.

● A $2,500,000 Bond Issue to finance construction of a power plant at Anchorage, Alaska, in an election Nov. 19 failed by seven votes to muster the necessary 51% of total vote needed for passage. The vote was 463 for, 457 against.

● California Committee on the Relation of Electricity to Agriculture will hold its Rural Electric Conference on Feb. 13 and 14 at Davis and on Feb. 17 and 18 at Los Angeles, it was announced last month by J. R. Tavernetti.

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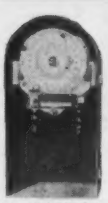

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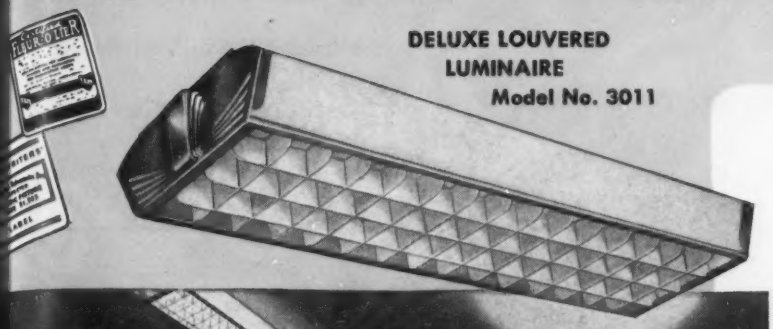

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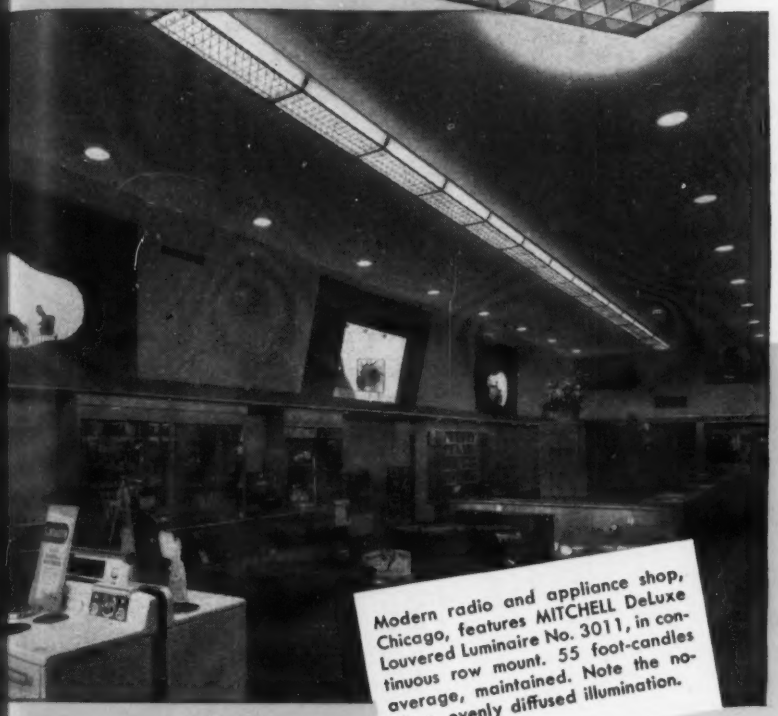
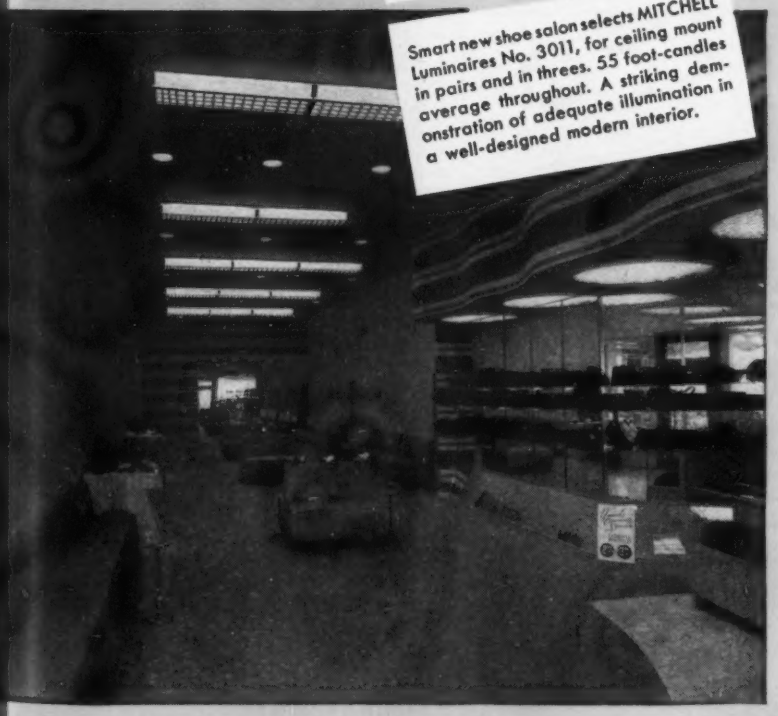


Modern radio and appliance shop, Chicago, features MITCHELL DeLuxe Louvered Luminaire No. 3011, in continuous row mount. 55 foot-candles average, maintained. Note the no-glare, evenly diffused illumination.



Smart new shoe salon selects MITCHELL Luminaires No. 3011, for ceiling mount in pairs and in threes. 55 foot-candles average throughout. A striking demonstration of adequate illumination in a well-designed modern interior.

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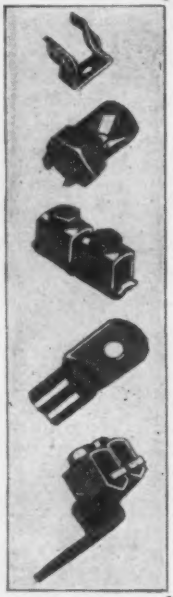

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San Diego Gas & Electric Makes Executive Changes

L. M. Klauber last month was named president of San Diego Gas & Electric Co., succeeding Hance H. Cleland, who was elected to the newly created, full-time office of chairman of the board of directors. In announcing its action, the board of directors said that the object was to reassign executive responsibility due to community

KLAUBER

growth and a general expansion of company operations.

Klauber was vice-president and general manager at the time of his promotion. A native of San Diego and graduate of Stanford University, he went to work for the company in 1911 as an electric salesman. In succession he was made engineering department head, superintendent of the electric production and distribution departments, assistant general superintendent, general superintendent, vice-president in charge of operations. In 1941 he received an honorary law degree from U.C. for "achievement in engineering and science."

Cleland became president of the company in August 1941, going to San Diego from California Oregon Power Co., of which he was president from 1938 until the move. He holds an LL.B. as well as a B.S. degree and has practiced law in Idaho, Alaska and Washington; served in the state of

Washington, at various times between 1913 and 1924, as a member of the legislature, assistant attorney general and a member of the Public Service Commission. From 1924 to 1938, he was in private practice, specializing in public utility law.

● JAMES HENDERSON has been appointed president of the Hilo, Hawaii, Electric Light Co. to succeed the late John M. Ross. Henderson, vice-president of the company since 1923, also has been a leader in the territory's sugar industry. He went to Hawaii from his native Aberdeenshire, Scotland, in 1900 and was associated with the sugar industry through 1922. He was formerly president of the Hilo Chamber of Commerce and has served as a director of the Hilo Gas Co., the Consolidated Amusement Co. and the Inter-Island Steam Navigation Co.

● WILLIAM R. SNYDER has returned to the Philippines to rejoin the Manila Electric Co. Prospects are that as electrical manager he will be concerned with the reconstruction of a war-torn utility, although the system is now reported to be serving a record-high load from emergency floating generating plants. Snyder, who fortunately got his family stateside just before Pearl Harbor, spent three years in a Japanese prison camp.

● MARKING the first change in personnel of the Cowlitz County (Wash.) board of commissioners since organization in 1936, EARL J. COLE of Ostrander has taken office. He defeated JAMES A. DOYLE in the Nov. 5 election. W. A. CARDWELL was reelected president of the board and J. H. SLADE was named secretary.

● S. J. LISBERGER, with Pacific Gas and Electric Co. for 42 years, retired Jan. 1. He was chief of the division of electric distribution engineering; will continue to serve the company temporarily in a consulting capacity.

● CLIVE E. BAUGH will direct PG and E's division of electric distribution engineering following Lisberger's retirement.

● N. E. GROSS, personal manager of PG and E's San Joaquin Power division, was made district manager of the new Contra Costa district, effective Dec. 1. To form the new district, PG and E grouped the territories handled by local managers at Antioch, Pittsburg, Martinez, Walnut Creek and Concord. Headquarters will be at Martinez.

● W. L. JONES, PG and E local manager at Martinez, retired Jan. 1, following 28 years of service with the company.

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Howard H. Bullock (left) and Wayne H. Allen receive Charles A. Coffin awards from S. E. Gates, G-E manager at Los Angeles. The awards are made to G-E employees for signal contributions towards increasing company efficiency or progress. Bullock is Phoenix manager; Allen is aviation engineer at L.A. Both won on wartime contributions

● GEORGE BRUNZELL has been appointed superintendent of plant, Spokane division, for Washington Water Power Co., succeeding the late A. H. Beckwith. Brunzell started with Washington Water Power as an electrician at Pullman and in 1938 was made division engineer for the Big Bend division at Davenport. He moved to a similar position at Coeur d'Alene, Idaho, in 1941 and in 1943 was made assistant superintendent of distribution, Spokane division.

● THOMAS INGLEDOW, vice-president and chief engineer of B. C. Electric, will direct the company's reorganized central engineering division. JOHN H. STEEDE, formerly assistant to the chief engineer, will be Ingledow's executive assistant. Other appointments include: C. W. COLVIN, assistant to the chief engineer; J. P. FRASER, assistant chief engineer of the electrical operating division; J. E. MACDONALD, superintendent of construction; H. W. SMITH, superintendent of station electrical engineering.

● LEWIS AMBROSE has been appointed superintendent of the Ellensburg, Wash., Municipal Light Department to succeed CHARLES CULP, who resigned after holding the position for three years. He has been assistant superintendent since last May, when he joined the department after serving as a captain in the Corps of Engineers. Culp will continue with the city as head of the billing department for both light and water utilities and will be placed in charge of maintenance and collection for parking meters when they are installed on the city's streets.

● GERALD W. WESTON was appointed executive vice-president of the National Association of Refrigeration Contractors at its annual convention in Cleveland, recently. Weston for a short time was manager of the Southern California Radio & Electrical Appliance Assn., in Los Angeles, leaving that position to become manager of the refrigeration group. His headquarters are in Cleveland.

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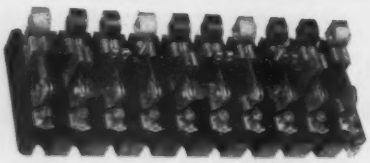

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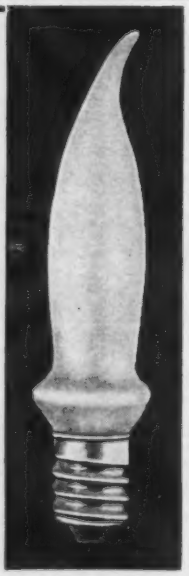

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Deaths

● JARED A. HILL, Pacific Gas and Electric Co., San Francisco, left the electrical industry of the West bereft of a level-headed, understanding and capable representative on the Electrical Committee, making the National Electrical Code; an effective advocate of adequate wiring, an inventor of new appliances and a friend of inspectors, contractors and dealers, when he died, Dec. 12, from kidney infection following a long illness. Born and educated in upper New York state, he

came West after experience with Solvay making TNT in World War I, worked for Hunter & Hudson, consulting engineers, joined PG and E, and after division sales experience, was taken into headquarters to head air conditioning, wiring and code responsibilities for that company. He had been secretary of the Air Conditioning Society, chairman of the Wiring Committee of PCEA, member of the executive committee of Southwestern Section, IAEI, and last year was made an alternate on the Electrical Committee, representing the light and power group.

● DR. GEORGE L. HOXIE, research engineer who retired from the Southern California Edison Co. in July 1938, died in Los Angeles Nov. 14. Dr. Hoxie was born in Leonardsville, N. Y., in 1872, and received his engineering and doctor's degrees at Cornell University. He was a professor at the University of Arizona and an instructor in electrical engineering at Cornell before beginning an engineering practice. He joined the Edison company in 1920 and was the author of several technical books on engineering and business.

● CLARENCE R. WILSON, electrical engineer, Pacific Gas and Electric Co., San Francisco, was killed Dec. 12, when struck by a bus as he was going to work. He was 59, and had been in the operations department of the company more than 30 years.

TRADE notes

● REULAND ELECTRIC MOTORS Co., Alhambra, Calif., manufacturers of small motors, has obtained a permit to build a $25,000 plant addition. The expansion will double the firm's production area; is expected to be finished in February. Employment, now 100, probably will reach 150.

● APPOINTMENT of ANTHONY F. BISGOOD as general sales manager of the Los Angeles district of the D. E. Sanford Co., manufacturers' representative, has been announced by the company. Bisgood was manager of the housewares department before his promotion.

● ELECTRICAL SPECIALTY Co. of San Francisco, Pacific Coast manufacturers' representative, is expanding its coverage to the eleven Western states. A new office has been opened at 810 14th St., Denver, with R. H. Bosworth in charge.

● ICEBURG REFRIGERATED LOCKER SYSTEM has appointed two new representatives in the West: Saviers Electrical Products Corp., Second and West Sts., Reno, Nev., and The Dell Smith Co., 3320 Whittier Blvd., Los Angeles.

Taken as the 1,000th motor came off production line at G-E's San Jose plant, picture shows Evelyn Kilmer completing tests. Looking on are Elliot D. Harrington (center), of Schenectady, on visit to plant; L. D. Fowler, manager, motor sales in Oakland Works

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FLEX-LOC Lamp Holder

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FS-40
AUTOMATIC Starter

CUTS OUT deactivated or flickering lamps. CUTS OUT current to lamp and ballast. Increases life of lamp and ballast.

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PROFILES *of the month*

General Mills home appliance department recently named three district managers in the far West. Robert Zurcher (above, left) heads the Pacific Northwest district, with headquarters in Portland. George A. Gillespie (above right) directs activities in the company's Pacific Central district from headquarters in San Francisco. George E. Newlin (left) is Pacific Southwest district manager and has headquarters at Los Angeles. All three come to General Mills with considerable merchandising experience

L. W. Luley, IES section chairman, Mrs. and Gilbert Hardacre, IES national president, and Conference Chairman Frank Hansen, at the Southern California Section President's Dinner, held at the Ambassador Hotel prior to the meeting

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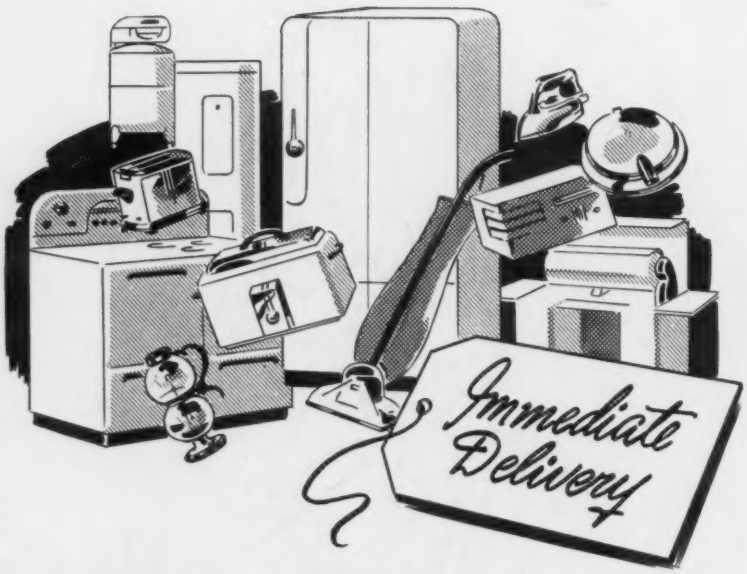

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The best prospects for electrical appliances are people who live in adequately wired homes. Only where there are plenty of outlets, switches and proper size wire, can full electrical service be enjoyed.

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